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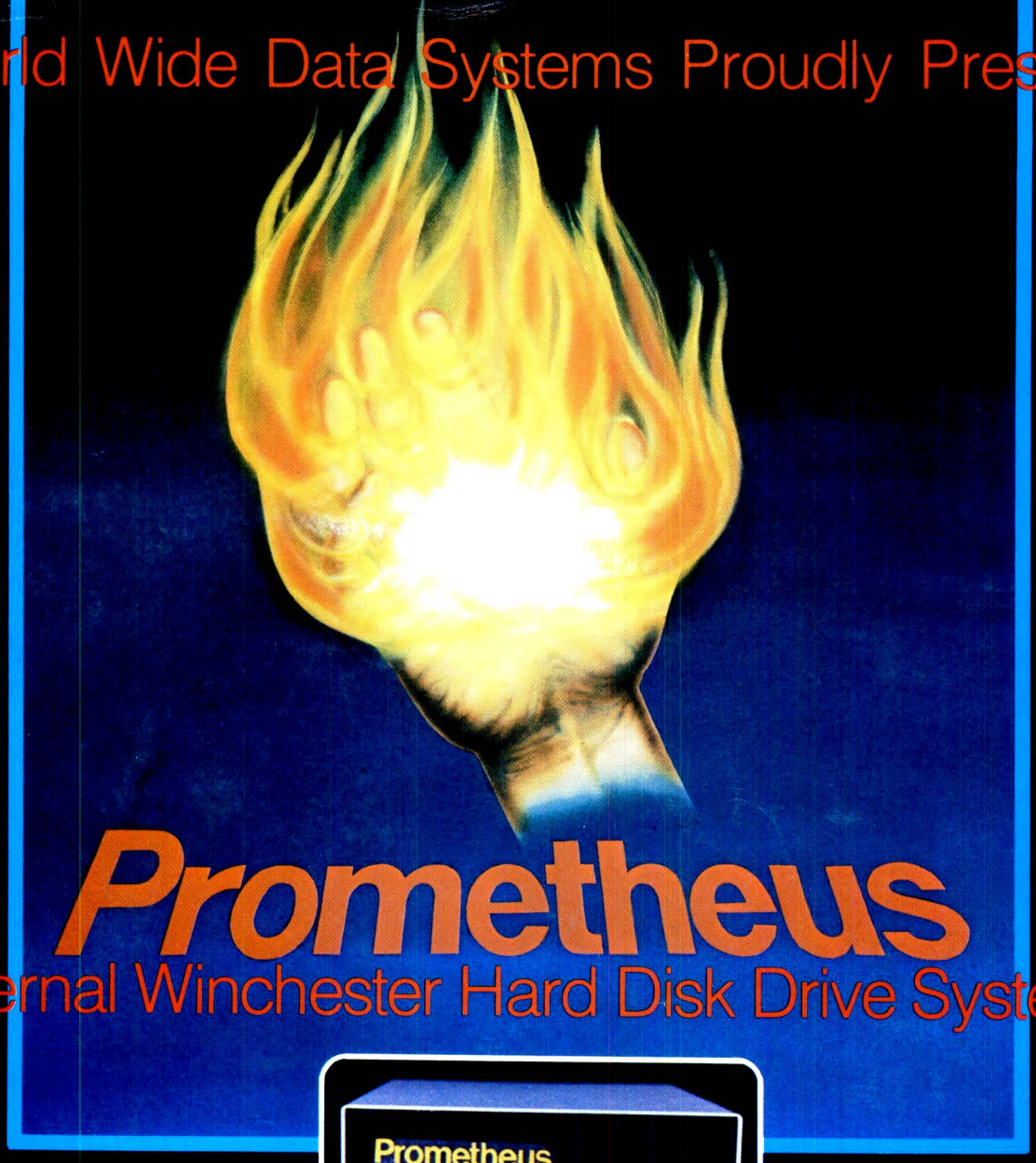

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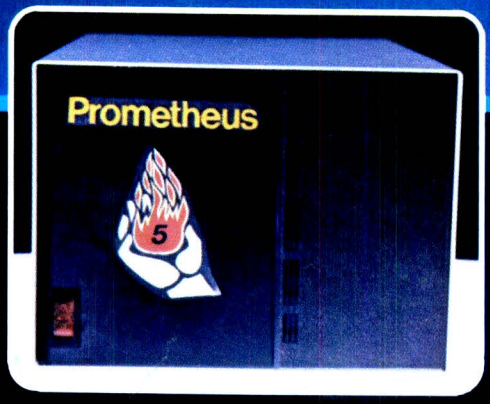

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Volume VII No. 4

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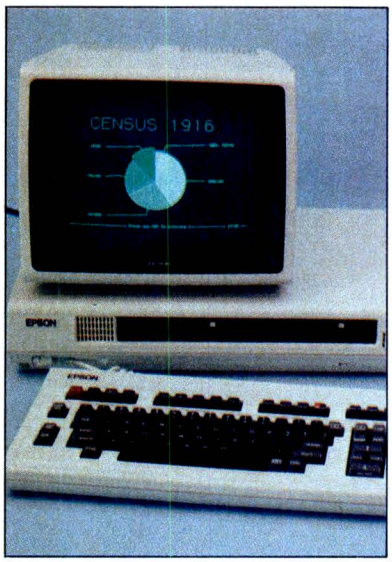

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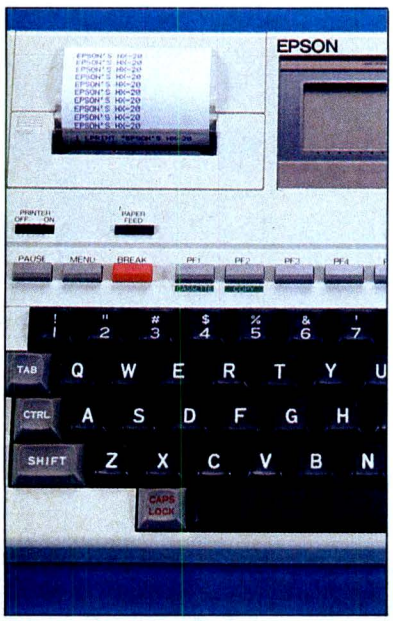

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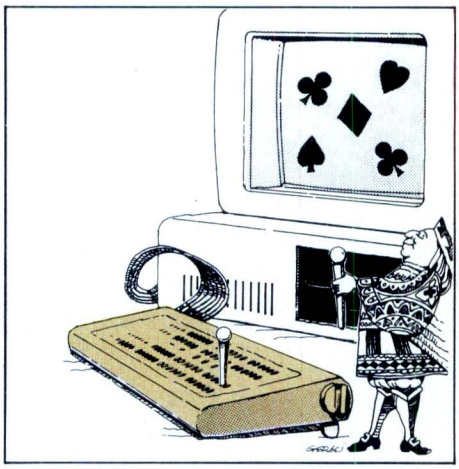

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PUBLISHER'S REMARKS By Wayne Green

Buy Now– Or Be Left Behind

Should Schools Wait?

There is no question that the technology of microcomputers is progressing, with systems becoming less and less expensive. Some pundits are now calling for schools to stop buying computers today because they are going to be cheaper next year. They will be even cheaper the year after that—and probably more advanced—so why not wait still longer?

We heard the same chant when the first television sets came on the market. "Don't buy them now, they'll be cheaper and better later on." Sure enough they were. But those who did not buy suffered the loss, not those who did. For while some people were waiting for prices to come down, the rest of us were enjoying the best years television ever had. Sure, we had to pay a high price (at the time) for a crummy black and white ten-inch set. But I don't think there is one of us television set pioneers who would have changed anything—except perhaps to leap aboard earlier.

In the computer field, the improvement in price/performance is there, no question about it, but if you wait, you lose valuable time through not having the computer. Sure, schools will be able to get more computer for their money next year—and ditto the year after. But the loss of computer experience for the students is much too high a price to pay.

Far too many teachers are isolated from the business world for which they are presumably educating the kids. It is already too late if kids graduate from high school without some serious exposure to computers. And the colleges which turn out graduates intended for any kind of industry are cheating them if they have not grounded them thoroughly in the normal business uses of small computers, such as word processing, spreadsheets, database, graphics, electronic mail and so on.

The price/performance of next year's computers is irrelevant. Students must be permitted to be computer literate today—not next year or the year after.

Some people are spreading the fear that computers bought today won't even be usable in another year or two. Rot. We're still using the very first microcomputers introduced on the market seven years ago. Just look at the best-selling computers of today. There is the TRS-80 Model III. Well, if you know anything about that computer, you will know it is a slightly improved version of the Model I, which was first brought out in mid-1977, five years ago! And the Apple II first appeared about the same time; and it is still going strong. So much for obsolescence. Nonsense.

The problem with most of the newer computers is that there are hardly any accessories or programs for them. Thus there are far fewer things you can do with them. And not having been through several years of gradual improvements, many of the newer systems tend to break more frequently. There's much to be said for picking one of the well-supported, well-proven, older computer systems. You'll find far more information about them too.

All Aboard for the Asian Tour

I invite you to accompany me and a bunch of other microcomputer people for a couple of weeks on one of the Asian tours of microcomputer shows or consumer electronics shows. The next Asian tour leaves from Los Angeles May 20. The tour will coincide with microcomputer shows in Tokyo, Taipei and Hong Kong. In the fall there will be another Asian tour, coinciding with consumer electronics shows in Japan, Korea, Taiwan and Hong Kong. The May tour will run under $2000 per person, so if you can get away, you'd better send for further information.

For a little extra you can add more countries to your trip, just as I added Sarawak, Brunei, Sabah, Singapore, Bangkok and Manila to my last Asian show tour. The extra cost was surprisingly small, and it adds three days to the tour for each country visited—one day of travel and then two in the country. When you look at it as a lifetime investment, the amount of time and money it costs is miniscule.

For more information on the Asian tours get in touch with Commerce Tours International, 870 Market St., Suite 742, San Francisco, CA 94102.□

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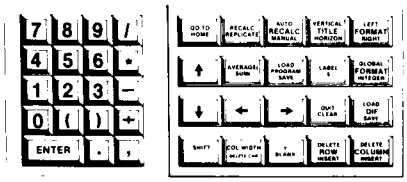

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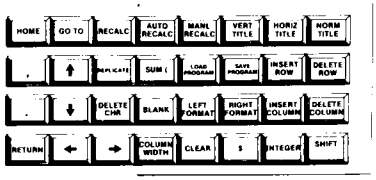

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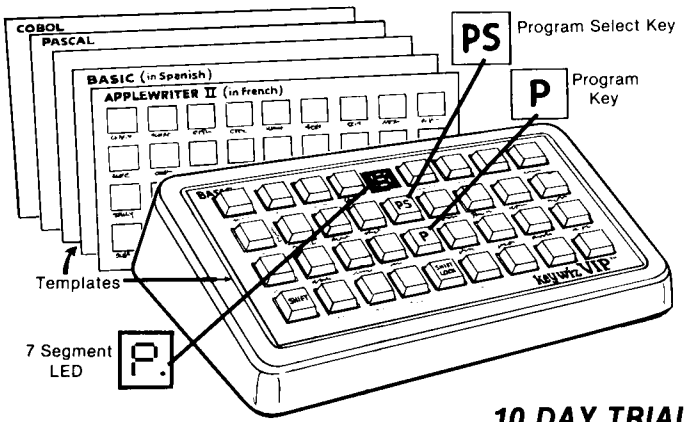

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[3] [4]

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WHAT'S NEW, BIG BLUE?

By Thomas V. Bonoma

Sorting Out Software

Hot and Cold Games, Utilities For the IBM

Getting Personal

This month, we'll clear the decks on an enormous amount of new software for the PC. We'll also look at a significantly improved version of Raceman.bas (which appeared in an earlier column), courtesy of one of our readers.

Additionally, I want to tell you about a new "electronic journal" for the PC; the journal is just finishing its first quarter of publication as you read this.

The mad dash to keep you informed about the PC software flood means that two of my promises from last month (to "spec" out a minimal and a heavy PC hardware system and to dish out the 1982 Best Software awards) will have to wait until May. Awww . . .

Software Everywhere . . .

You'd think from the amount of space we chew up each month looking at new software that we're capturing the bulk of it. Not even close—you should see what I *don't* review.

Some low-quality software is hitting the market, and it's not all from fly-by-night houses, either. I've thought of adding a worst-package-of-the-month category, but my lawyers tell me that's a good way to get into trouble.

If you're thinking of picking up an expensive software package that I've not yet reviewed, drop me a note on the Source (TCD292). Chances are, I'll have seen it or know about it. In any case, get a demonstration. That's what those retail margins are for.

Utilities

I owe an apology to the folks at Indigo Data Systems (100 E. NASA Road One, Suite 107, Webster, TX 77598). They produced three great utilities that I was *sure* I reviewed before, but apparently forgot to do.

Print-It, a screen dump utility for the Graftrax-modified Epson, resides in DOS, invisible to the user. It comes in six different versions that allow you to dump your graphics either upright or rotated 90 degrees, regular size or double size, and in black-on-white or white-on-black. It's one of the most flexible screen dumps I've seen.

Color-It does the same thing for the IDS Color Prism printer—and in living color. If you have a Prism, this one's a must.

And, so you don't wait half the day for your user program to dump itself to your Epson or to a serial printer, take a look at Spool-It, a software spooler (also invisible to normal operations) from the same company.

Spool-It comes in ten versions (five with a kill feature and five without). You can choose the size of the spool buffer you want (depending on how much memory is in your machine); it ranges from 8K to 64K.

All three programs are well-documented on a single page of instructions. This page is laminated for long life and hole-punched for easy storage in your operations manual. The only shortcoming I've found is that Spool-It and either graphics dump program cannot be coresident; it's one or the other, which means that those graphics dumps (especially in color) take a while.

Computer Cooking

Norrell Data Systems (3400 Wilshire Blvd., PO Box 70127, Los Angeles, CA 90010) has released a flock of nicely done programs for the PC.

Computer Chef Cookbook ($49.95) is a recipe-filer, manipulator (try Mississippi Mudpies scaled up for 2038 visitors) and indexer, and it's supplied with a separate disk of recipes. The System-Backup utility ($50) is useful for copying uncopyable disks. It operates with DOS 1.0 and 1.1 and works without user intervention on two disk systems.

Disk Magic ($49.95) and Pack & Crypt ($49.95) are also useful utilities. The former allows you to access data on disks on a track-and-sector basis in both Hex and ASCII. It features a top-quality tutorial.

Pack & Crypt is a text compression program that compacts files to take up less space on the disk. Programming files can be reduced up to 40 percent with Pack, while data files are often only one-third as long after packing. Crypt, on the same disk, is a file encryption/decryption program that can help you secure sensitive files and programs.

Easyproof, a spelling checker ($79.95) from Norrell, is supplied with a 50,000-word dictionary in compressed format. The program detects more than 99 percent of all spelling errors and works at the amazing speed of 5500 words per minute. All of these utilities are supplied in compiled form for fast execution, and all are well-documented with tutorials and punched pages for insertion into your operations manual.

Super Zap ($45) and the PC Toolbox ($35), both from Alta Systems, Inc. (PO Box 9802, Suite 181, Austin, TX 78766), make up a disk- and sector-access program and a set of routines to change system features.

The Toolbox is an especially interesting set of programs; it gives you an extended directory lister and a list program that sets line printer parameters and lists the file in question. The Toolbox is supported by a companion program, Setlist, that initializes the printer in any way you'd like.

Clock and Setclock give you control over the system clock and its display; the file utility and monitor programs "unhide" files and switch you between color and black and white.

The listing programs in this package are probably the most interesting. Peter Norton's utilities (which you should have) provide the other programs and many more for less money per program.

Freeware Software

Speaking of listers, Computerenergy

Address correspondence to Thomas V. Bonoma, 45 Drum Hill Road, Concord, MA 01742.

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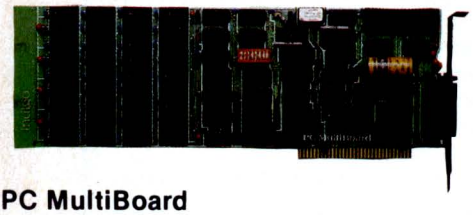

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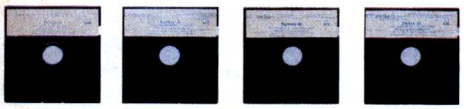

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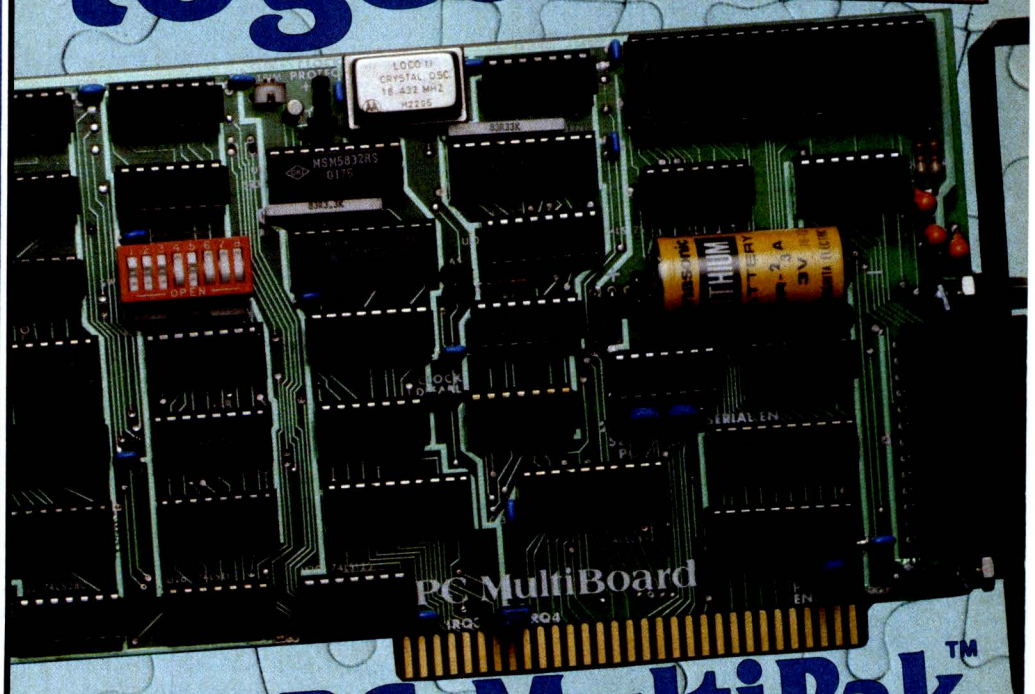

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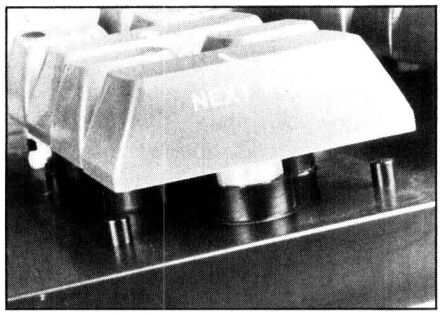
32-character buffer prevents "lost" characters if something is typed while the main processor is busy. Data is transmitted from the keyboard serially at 1200 baud.

Most of the keys have an automatic repeat function. Hold them down for a half-second and they begin to repeat (at a reasonable rate) until released. The keys have a solid feel to them; action is light to moderately light and provides a sufficient amount of noise to make the keyboard psychologically comfortable to use.

Each key is mechanically and electrically independent from all others, and replacement of defective keys is



A detailed photo of the keyboard construction. Three main plastic assemblies are used: the keyboard base, the keyguide plate (the black base shown under the keys) and the top cover. The keyguide serves double duty by supporting and guiding the keys during depression and protecting the key switches and electronics from dirt and coffee.

The two disk drives used in the QX-10 are made by Epson. These double-sided, double-density drives provide the system with about 640K of on-line storage. They are driven by one of the seven available DMA (Direct Memory Access) channels available on the computer bus. Disks are loaded by inserting and pushing them into the slot until they "click" into place, at which time the push button is depressed. They are unloaded by hitting the push button again.

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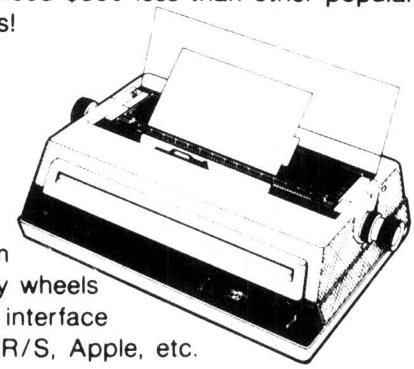

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and is suitable for joysticks or keyboard. Its only setback is a scrolling problem between games; the top line of the screen is lost by the "Play Again?" prompt.

Finally, you might want to check into Starcross, the latest from Infocom (55 Wheeler St., Cambridge, MA 02138; $44.95). This space adventure (from the creators of Zork and Deadline) is awesome! You'll need the full-color space map (which is supplied) just to get to where the adventure begins. Getting in is another matter!

When you do, you find yourself on a derelict spaceship with natives, grues, a mile-high forest and innumerable rooms to explore. If you don't make repairs in time, you'll die. (A hint to voyagers: if you smell coal gas or window cleaner, you blew it!)

Databases, Combination Programs

Some interesting combination programs for the PC are making appearances. One of the best examples is LazyCoder-Screen (Nelson Data Resources, 900 South 74th Plaza, Omaha, NE 68114). It costs $125 and requires 64K, two disks and an Epson/IBM printer.

Think of LC as an electronic blackboard that lets you use the screen freely to design images, data-entry screens or whatever else you'd like, using any of 35 built-in design functions. To create a filing system, for example, just design the screen—and it's done!

LC automatically generates the Basic code needed to input/output the data. You can build presentations or instructional aids by "stringing" screens together—like a slide show. LC is provided with a demonstration disk on which the entire tutorial has been done with these linked screens. Putting a border around your screen or using the PC's special graphics characters is as simple as hitting a function key.

A new program, LazyCoder-Report, will be released in the future to help you get your data back out of the databases you design. This sounds like a good program, especially at the price. Get a demonstration at your dealer.

TextPlus (Owl Software Corp., 6927 Atoll Ave., N. Hollywood, CA 91605) is available in a 64K version ($200) and a compiled, 128K version ($240).

TextPlus is a combination word processor, database manager and mail-merger with (limited) graphics abilities. It's designed for the salesman or professional who writes loads of short letters and manages small files of data.

The TextPlus word processing program is designed to provide a functionality slightly greater than version 1.0 of Volkswriter. The database manager is not as sophisticated as WordStar's mail/merge or TIM III, but it's designed to capture small lists and files quickly for later merging in letters.

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The authors provide an extensive set of printed documentation and high flexibility in configuring the system to work with all your printer's options (more than 15 typefaces with an Epson, for instance). The authors even include a bar charting facility.

If you fall into the category for which this program was written, and if you like the notion of a word processor/DBMS all in one but don't require manuscript-writing capabilities or professional DBMS capacity, this first-rate program fits the bill.

To make the best choice, compare TextPlus to VersaText (from TexaSoft, $199.95). VersaText also integrates a word processor and DBMS written in Basic. This version of VersaText, however, is not compiled, so the most appropriate comparison is to the 64K version of TextPlus.

If you're a logical thinker, Forth will intrigue you . . .

A Letter for LogiQuest

"What I want is a fully gizmoed database manager (perhaps written in Pascal for ease and speed) that couples interactively with a spreadsheet program, supports hard disk, lets me run with multiple files at once, has its own on-board mail/merge system and maybe even a text editor so I can write letters without ever lifting my hands from the keyboard. I'll pay a lot, all right, but only half of what I'd give for Condor."

This letter, sent in by a user, accurately defines LogiQuest III (from Software Products International, 10343 Roselle St., Suite A, San Diego, CA 92121). LogiQuest III sells for $550 (although you can get the downgraded versions, LogiQuest I or II, for $125 and $250, respectively).

Although it is a sophisticated and advanced DBMS in and of itself, the beauty of LogiQuest is that the user can use it as an integrated package with LogiCalc (a spreadsheet program) or with any of SPI's integrated accounting packages. The programs were designed to work together in order to run the small business or professional office.

LogiQuest III is a professionally done package that may offer a real alternative to DBII (to be reviewed next month) and Condor's DBMS.

Miscellaneous & The Electronic Journal

Sounds like a rock group, doesn't it? It's actually an uncollected array of packages I thought you should know about.

In the operating system realm, PC/Forth ($100 from Laboratory Microsystems, 4147 Beethoven St., Los Angeles, CA 90066) is an inexpensive and useful full Forth, complete with debugger, screen (as well as mini-editor) and a number of Forth "screens."

If you've ever had the desire to learn another language besides Basic, and if you're a logical thinker, Forth will intrigue you with its "postfix" notation ("2 3 *"—that's 2 times 3), stack manipulation and compactness.

The extensions to the Basic language available from Laboratory Microsystems include some outstanding graphics routines (including printer dump) and floating point routines (the basic Forth doesn't believe in decimal numbers). To learn the language, you're going to need a tutorial; Leo Brodie's *Starting Forth* (Prentice-Hall, 1982) is just the book. It's available from the Forth Interest Group.

If you've always been a "C" person, then try C86 C Compiler (from Computer Innovations, 75 Pine St., Lincroft, NJ 07738).

This package contains the compiler itself, a reference library and associated programs. It does not, and is not meant to, teach anyone the C language, but if you're in this esoteric crowd, you don't *need* anyone to teach you the C language.

Not Just Another Editor

Oh no, not another text editor . . . Here comes Xywrite (from XyQuest, Box 372,

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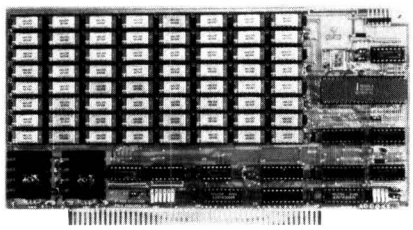

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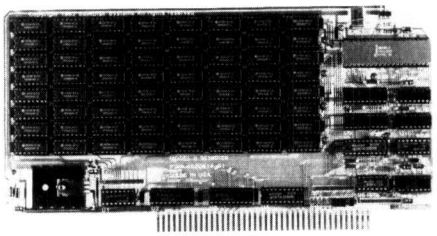

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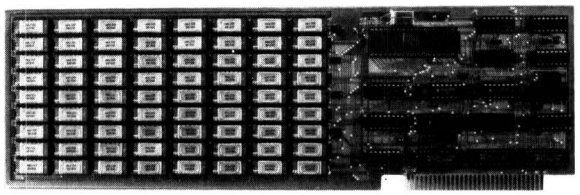

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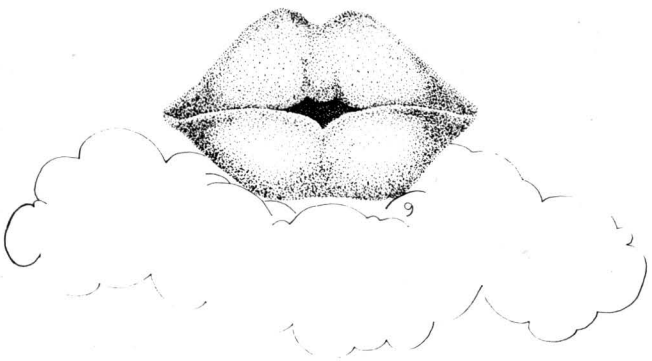

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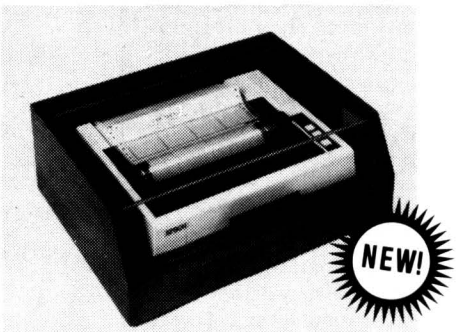

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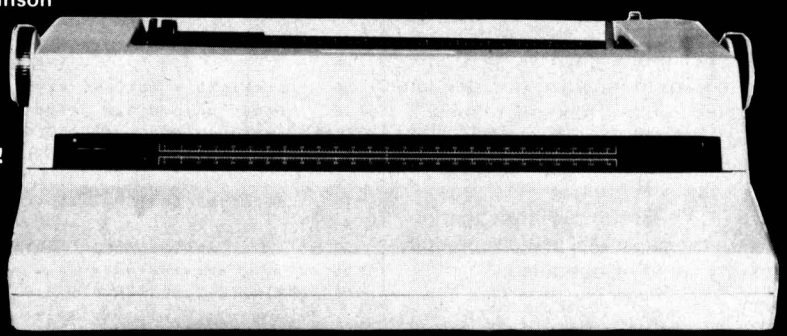

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Bedford, MA 01730). It has as many features (word-wrap, on-screen margin control, save, merge, search, justification and a host of others) as other programs, but the key to Xywrite is its price—$50.

If you're in the market for a text editor, take a look at Xywrite. The documentation is outstanding, much like Volkswriter's, and the system performs well at a reasonable cost to the user.

Reading Your Mind . . .

Enough, already—I can barely turn on the machine, much less program in Basic. Quit telling me about letters of the alphabet and "weird" programming languages! Give me something *useful.*

When I announced the appearance of the Personal Computer Journal way back in October, I told you that at the asking price of $85 per year or $54 for six months (from Personal Computer Journal, West 2317 Garland, Spokane, WA 99205), you should let me look first. Well, I've looked, and these people have a great idea!

The December 1982 PCJ, which I reviewed, contains news, opinion, tutorials and eight programs. And they're not second-rate schlock programs, but useful ones that you can use immediately and learn from.

For example, PALETTE.BAS turns your color screen into a multicolored (many more colors are implemented than the PC's basic set) sketching pad. Provisions are made to save, fetch and "plant" images from the disk, to employ the XOR and other esoteric options of PSET, and to change background, foreground and even the width of your artist's brush at the push of a single function key.

PCJ is outstanding, and the first issue alone is worth nearly the price of a six-month subscription.

Other programs on the disk (both sides are used) are a screen processor, a personal mailing system, a program to unprotect other protected Basic programs and a program to initialize the function keys. Good PC-sized documentation is provided with each program, and two reference charts are thrown in for good measure.

I give PCJ a strong recommendation, but I wish the paper stock and reproduction clarity could be upgraded.

A Basic Bug? Split Opinion

January's column reported a suspected Basic "bug" involving the STR$ function. Opinion has been split on whether it *is* a bug, but most informed readers are of the opinion that it's just an idiosyncracy in different implementations of "standard" Microsoft Basic.

The following letter seems to be a logical explanation of what's going on:

Dear Mr. Bonoma,

I read your column ("Is IBM's Basic Bug-Infested?") in the January issue of *Microcomputing.* I ran into a similar problem programming a Tektronix 4051 Graphic System at the plant where I work.

I was inputting digits using a string, and determining the actual number of digits input using the LEN function. I found that the string length of the number 99 is 3. I also found that the string length of the number −99 is 3.

This seemed to make sense because the sign would occupy one space. Normally, the sign is understood when reading a positive number. Tektronix 4051 Basic adds a space to positive numbers to keep the string length the same for both positive and negative numbers. This gives a sign justified printout without using print format statements.

I found that my home computer does not have this feature. The printout is not sign-justified and the string length of a positive number is one less than a negative number.

I guess what it boils down to is that the programmers who write Basic interpreters write them the way they feel they should be written. I have been writing Basic programs for six years and I have never copied a program out of a magazing and had it run without some modification.

Yours truly,
Andrew Carpenter

> If you're in the market for a text editor, take a look at Xywrite. The documentation is outstanding and the system performs well . . .

User Program: Improved Raceman.bas

One of the nice things about doing this column is the mail, which is always welcome. Peter Baenziger of Kalamazoo, MI, wrote not only to compliment me for my previous programs in the column, but to chastise me for Raceman.bas, presented in the December 1982 *Microcomputing* (p. 22) to illustrate the cursor control keys on the PC.

Baenziger said he feels I stayed too close to the original program fragment I adapted, used "kludgy" code when it was unnecessary and, in general, did a less-than-first-class job.

After closely reading his letter, I wrote and told him I thought he was right! I also got his permission to publish his improvements to Raceman.bas, which he calls Raceman3.bas (see Listing 1). It's heavily commented, so you should have no trouble following his clean code.

If you study Baenziger's program, you can learn a great deal about Basic programming on the PC. Pay special attention to the way in which the program is broken up into main segments through the judicious use of comments. And notice how Baenziger avoids commenting in places where speed is crucial.

If we all keep trying to improve this program, we're going to have a commercial game yet! Anybody want to try the next revision?□

Listing 1. Improved version of Raceman.bas program. This version, Raceman 3.bas, was sent in by Peter Baenziger of Kalamazoo, MI.

```
 10  '                  ******** RACE MAN3 ******
 20  ' A slightly revised version of program in Microcomputing, December 82
 30  ' Based on program fragment in Creative Computing, September 82
 40  ' Based on program in Creative Computing, November 1980
 50  ' Peter Baenziger, 1215 Lane Blvd, Kalamazoo, MI 49001
 60  '
 70  ' Requires BASICA, either monitor will do, no printer needed
 80  '
 90  '       Initial Input Screen
100  '       ***********************
110  DEFINT B-Z:SCREEN 0,1,0,0:WIDTH 80 ' Set up basic screen configuration
     and declare all variables except those starting with A as integers
120  CAR$=CHR$(232) ' Car shape
130  DIM CURB$(2):CURB$(0)="/":CURB$(1)="|":CURB$(2)="\" ' Curb shapes
140  CLS:KEY OFF
150  LOCATE 5,28:COLOR 15:PRINT "** RACE MAN **" ' High light color
160  PRINT TAB(28) STRING$(14,"*"):COLOR 7 ' Back to regular color
170  LOCATE 9,6:PRINT "All you have to do is to keep your car on the road
     -- a very easy job!"
180  LOCATE 11,14:PRINT "Left cursor to turn left, right for right."
190  PRINT TAB(14) "Cursor up speeds up, cursor down slows down"
200  LOCATE 14,14,1:PRINT "Set the speed from 9 (Beginner) to 0 (Race Man)
     "; 'Turns cursor on
210  SPEED$=INPUT$(1) ' 1 digit input, without return
220  IF SPEED$("0" OR SPEED$)"9"THEN BEEP:GOTO 200 ELSE SPEED=VAL(SPEED$)
230  LOCATE 17,25:COLOR 31:PRINT "Press any key to start  "; ' Blinking
     highlight color
240  K$=INPUT$(1) ' Waits for any key input
```

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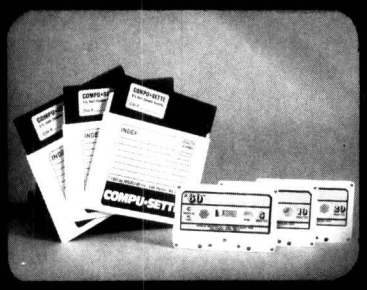

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Listing continued.

```
250  '
260  '      Game Initialization
270  '     ====================
280  KEY (12) ON : ON KEY (12) GOSUB 640 ' Cursor left key
290  KEY (13) ON : ON KEY (13) GOSUB 650 ' Cursor right key
300  KEY (11) ON : ON KEY (11) GOSUB 670 ' Cursor up --- faster
310  KEY (14) ON : ON KEY (14) GOSUB 690 ' Cursor down --- slower
320  PLAY "MB" ' Plays the sound in the background, while the program goes
     on
330  ' These enable the interrupt functions and background sound for the
     program. The program does not have to loop through them to keep them
     in effect
340  '
350  CLS:LOCATE ,,0:COLOR 7 ' Clear screen, turn cursor off and set normal
     color
360  RANDOMIZE(VAL(RIGHT$(TIME$,2))) ' Changes the random number pattern
     every time the game is played
370  X=1 ' Initial value for curb$(), straight ahead
380  SCORE=0
390  ROAD=8+SPEED ' The "faster" the speed, the narrower the road
400  DELAY=SPEED*2 ' Adjusts the speed of the game
410  DURATION=(SPEED\7)+5 ' Length the "racing sound" is played
420  PITCH=50+((9-SPEED)*3) ' Higher pitch when faster
430  LCURB=30 ' Left curb of road
440  RCURB=LCURB+ROAD ' Right curb of road
450  CAR=LCURB+(ROAD\2) ' Car location in the middle
460  '
470  '      Main Loop
480  '    =============
490  ' Main loop is not annotated to keep the speed up, remarks slow things
     down
500  IF (LCURB)=CAR) OR (RCURB(=CAR) THEN 780
510  PRINT TAB(LCURB) CURB$(X) TAB(CAR) CAR$ TAB(RCURB) CURB$(X)
520  SOUND PITCH,DURATION
530  CSRPOS=CSRLIN:LOCATE 25,20:PRINT USING "Score:  ####          Speed: ##
     ";SCORE;SPEED;
540  LOCATE CSRPOS,1
550  A=RND(1):IF A(.6 THEN 570
560  Y=FIX(RND(1)*3):IF X=Y THEN 560 ELSE X=Y
570  LCURB=LCURB+X-1:IF LCURB(1 THEN LCURB=1
580  RCURB=LCURB+ROAD:IF RCURB)70 THEN LCURB=70-ROAD:GOTO 580
590  FOR N=1 TO DELAY:NEXT
600  SCORE=SCORE+1:GOTO 500
610  '
620  '    On key subroutines
630  '   ====================
640  CAR=CAR-1:RETURN ' Move the car one to the left
650  CAR=CAR+1:RETURN ' Move the car one to the right
660  '
670  SPEED=SPEED-1:IF SPEED(0 THEN SPEED=0 ' Cursor up - faster
680  GOTO 710
690  SPEED=SPEED+1:IF SPEED)9  THEN SPEED=9  ' Cursor down - slower
700  ' All speed related values updated
710  ROAD=8+SPEED:DELAY=SPEED*3:DURATION=(SPEED\7)+5
720  SOUND PITCH,0:PITCH=50+((9-SPEED)*3) ' Sound 0 empties background
     sound buffer
730  RETURN
740  '
750  '
760  '      Crash and end routine
770  '     ======================
780  SOUND 50,0 ' Turn off racing sound
790  COLOR 31:PRINT TAB(CAR) "***  CRASH!!!" ' Print "Crash" in flashing
     type
800  FOR I=1 TO 20:SOUND 90+I,1:NEXT I ' Turn on crash sound
810  '
820  LOCATE 25,20:COLOR 15 ' Highlight color
830  PRINT "You scored" SCORE "points at speed" SPEED
840  FOR I=1 TO 1500:NEXT I ' Delay to let you read the score
850  COLOR 7:LOCATE 25,20:PRINT SPACE$(40); ' Clear the prompt area
860  LOCATE 25,20,1:PRINT "Want to try again (Y/N or speed)?  ";
870  K$=INPUT$(1):IF K$="y" OR K$="Y" THEN 900 ' Input without return works
     better in a game
880  IF K$("0" OR K$)"9" THEN KEY ON:END ' If not y or number 0 to 9, end
     game
890  SPEED=VAL(K$) ' New speed value
900  COLOR 31:LOCATE 25,20:PRINT SPACE$(40); ' Clear the prompt area
910  LOCATE 25,20:PRINT "Press any key when ready  ";
920  KEY(11) OFF:KEY(12) OFF: KEY (13) OFF: KEY (14) OFF ' Turn off
     interrupt action of keys, or they won't work for "any" key
930  K$=INPUT$(1):GOTO 280
```

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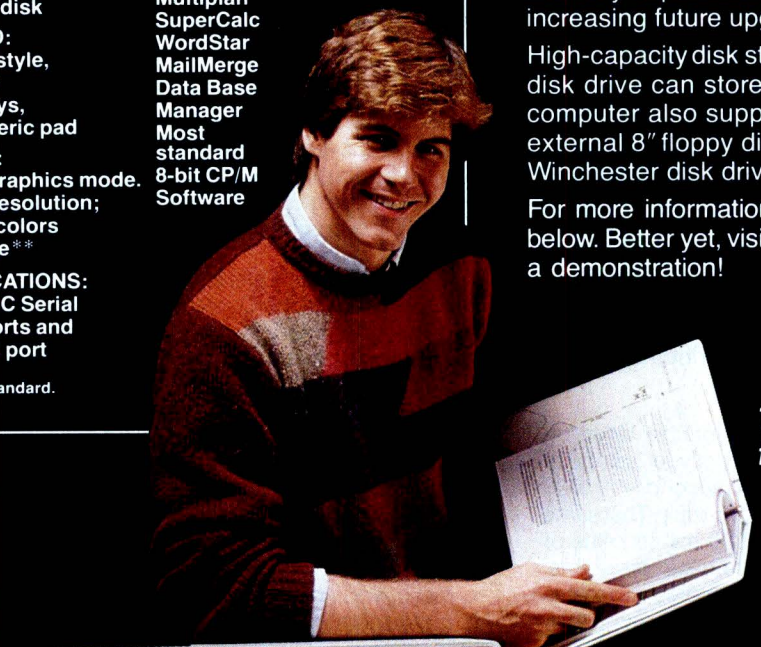

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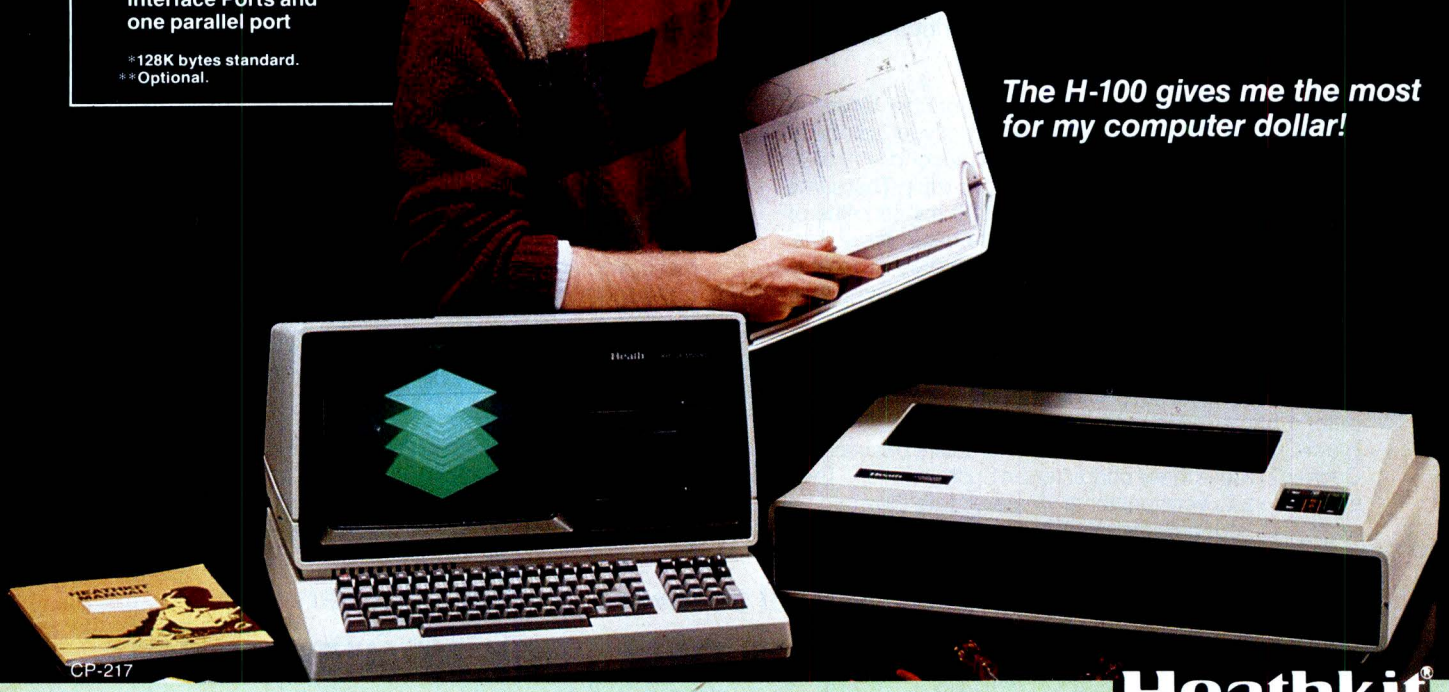

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By Frank Derfler

Filling Gaps In the Market

Modem Makers Target IBM, Radio Shack

In this issue of Dial-up Directory, we'll present the results of our "What do you do with a Hayes Chronograph?" contest. We'll also examine the first internal modem for the IBM PC to reach the market.

But first, let's take a look at some new data communications equipment released by Radio Shack.

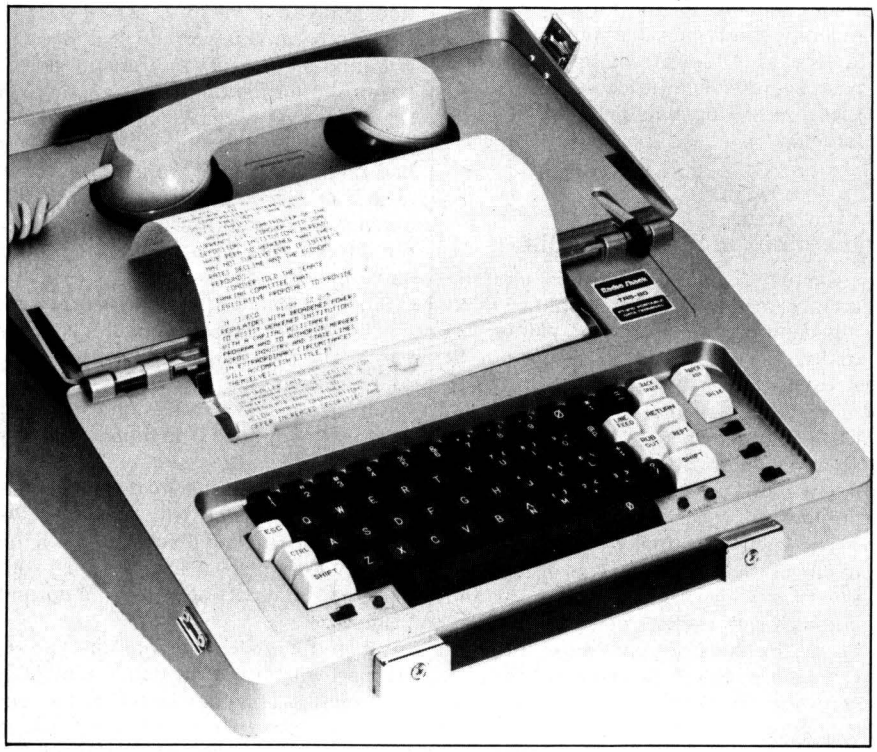
The Shack's Data Devices

I haven't had too many nice things to say about Radio Shack's Modem II. I think the device is difficult to use and not designed with the consumer in mind. The folks at the Shack, however, have come out with some new data communications devices with impressive features.

Radio Shack seems to be continuing its drive to meet the needs of almost any microcomputer user with a TRS-80 product. The Shack caters to users in every niche in the market, from the beginner needing a simple 16K Color Computer to the sophisticated business user needing terminals, 16-bit processing power and even local network connections.

Filling Gaps

A few months ago, Radio Shack unveiled a new portable printing data terminal and a Bell 212 standard 1200-baud modem. Both of these devices fill small "gaps" left in TRS-80 market coverage.



The new TRS-80 PT-210 portable printing terminal includes a full-size keyboard and quiet thermal printer. A built-in modem and acoustic coupler provide complete capability for data communications over the telephone.

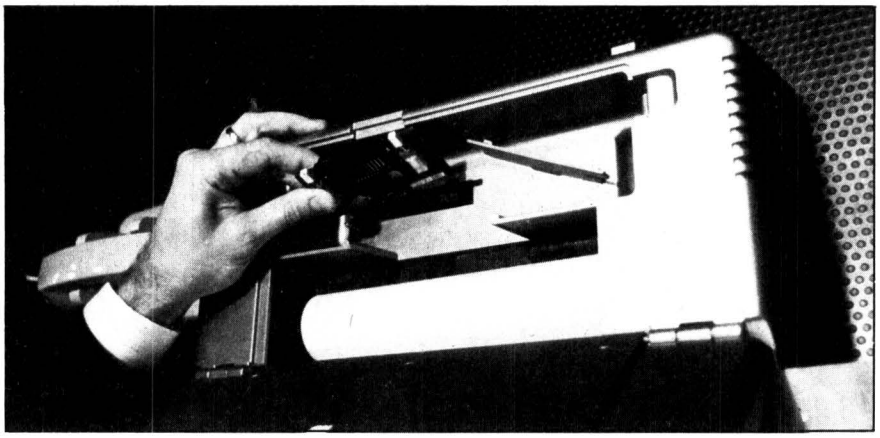
The portable terminal combines a full typewriter-style keyboard, a quiet thermal printer and a Bell 103 modem with an acoustic coupler in a 15-pound package. A small optional printed circuit board can easily be plugged into a slot in the back of the machine to provide an RS-232C interface. This interface can be used for connection to a host system or to a direct-connection (plug-type) modem when operation with the acoustic modem is not desired.

The keyboard of the PT-210 can transmit 99 ASCII characters, including 32 control codes. The printer, however, can form only 71 characters. Lowercase characters are automatically printed as their uppercase equivalents. The machine prints at a speed of 50 characters per second. Each eight-inch printed line can include up to 80 characters.

The PT-210 needs nothing but paper to function as a complete portable printing terminal. Radio Shack sells the special thermal-sensitive paper in boxes of six rolls for $24.95.

The machine's lid covers the printhead

Address correspondence to Frank J. Derfler, Jr., PO Box 691, Herndon, VA 22070.



An optional card can be inserted into a slot in the back of the PT-210 to provide an RS-232C interface. This interface allows the PT-210 to serve as a local terminal and/or printer for a computer. RS-232C is also a convenient way to connect to an external modem.

and keyboard—for travel's sake—and the case includes a carrying handle. Radio Shack also sells a foam-padded travel case for those who might want to protect the outside of the cabinet from wear and tear.

High-speed Entry

The TRS-80 DC-1200 High Speed Direct Connect Modem represents a new entry into the high-speed modem market for Radio Shack. The company's previous modems have been limited to 300-baud operation.

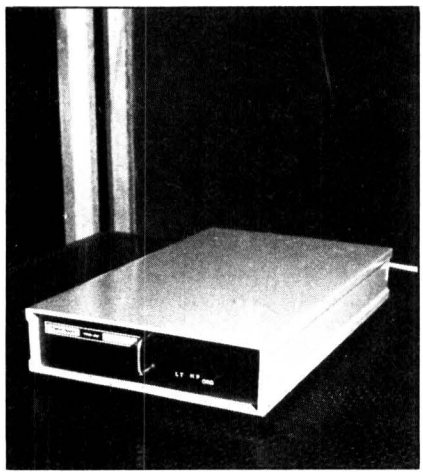
The DC-1200 modem can operate with asynchronous systems at 300 baud, using the Bell 103 signaling standard, and either synchronously or asynchronously at 1200 baud, using the Bell 212A standard. It will operate in either the originate mode or answer mode and includes a self-test function.

The DC-1200 connects directly to the phone line with a modular plug. It comes equipped for automatic answer operation. An optional add-on autodialer accessory is available for $149.95. The modem interfaces with the computer or terminal through the RS-232C serial port; it's powered from the 117-volt wall socket.

The DC-1200 carries a retail price of $699. This places it in the middle price range for Bell 212A standard modems.

These products are part of an apparently continuing program on the part of Radio Shack to expand its line of computers, peripherals and accessories to meet every part of the market.

Few products advertised in *Microcomputing* don't have some equivalent in the TRS-80 line. The only hardware items missing seem to be a printer despooler, a color capability for the TRS-80 business machines and a portable computer in the style of the Osborne. If Radio Shack's past aggressive attitude is any guide, these market openings will not be open for long.



The TRS-80 DC-1200 modem provides 1200-baud service using the Bell 212A signaling standard. It represents a new entry into the high-speed modem market for Radio Shack.

Internal Modem for IBM

Cactus Technology sounds like the name of a company that should be making hand cream out of aloe plants. Actually, Cactus has been sitting out in Arizona putting together and bringing to market the first internal modem for the IBM PC. While Cactus soon will be joined by many others, it deserves credit for being the first and for delivering a good product.

The Cactus Technology modem fits into one of the expansion slots on the IBM PC. It provides complete autodial and auto-answer modem operation at 300 baud. The telephone line connects directly to the modem; the modem card also serves as an RS-232C serial port for the IBM PC.

The designer of the PC-COM-300 cleverly made use of the speaker in the IBM PC to provide audible monitoring of the telephone line while calls are being made. The modem comes with a short piece of cable and connectors properly keyed to allow it to jumper the normal speaker connections through the modem board. The normal operation of the speaker is not changed, but it is given another job to do when a call is being placed.

The installation of the Cactus Technology modem is not difficult, but unless you have fingers like E.T., you'll need to take out all of the expansion boards in the four left slots to reach the speaker connector without bending something. If you take your time, this is an easy installation.

The key to the operation of the PC-COM-300 is the fact that it is addressed as the standard RS-232C port (COM 1). This means that the basic modem transmit and receive functions can be used by standard terminal software designed for the PC. The common software packages (for example, Crosstalk, Ascom and PC-Talk) will not be able to use the auto-answer and autodial functions of the modem.

Dialing Directory

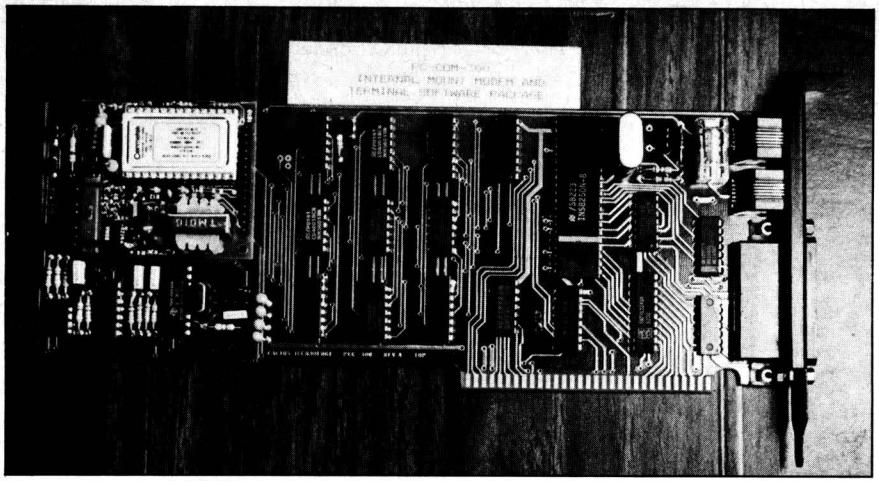
The Cactus Technology modem comes with a communications software package that does perform the auto-answer and autodial functions. This package is written in Basic and provides a dialing directory of ten telephone numbers, storage of the communications specifications associated with each number, and the ability to capture data to disk files and to transmit disk files to another system equipped with the same communications program.

The program I saw would be difficult, if not impossible, to use for transmission of files to information utilities, such as Source or CompuServe, or for transmission into other electronic mail systems. It had no provisions for transmitting lines of text in response to specific prompts, and no provision for slowing the throughput of the transmission to keep from choking host systems.

Since the Cactus Tech program is written in Basic, someone will certainly patch the autodial and auto-answer routines into more capable Basic programs, such as PC-Talk and PC-Modem. This will enhance the appeal of the modem hardware.

The Cactus Technology designers performed a little trick with the RS-232C serial port on the modem board. Until the modem recognizes a tone and goes on-line, the serial port operates in a normal fashion.

When the modem goes on-line, the serial port will output the data the modem is receiving. This may be handy for running a printer in parallel (it would have to be fast!) or for sending the output of the modem to another local terminal for display. This does not mean that the modem can be used by an external terminal.



The Cactus Technology PC-COM-300 modem mounts in one of the expansion slots in an IBM PC and provides both a 110/300-baud modem and an RS-232C serial port. The modem is addressed as the standard IBM serial port, but unique dialing and auto-answer commands are used. A Basic language communications software program is supplied with the PC-COM-300.

Modem-on-a-chip

Electrically, the Cactus Technology modem centers around a modem-on-a-chip from Texas Instruments. Cactus Tech has done the work of interfacing with the PC. The design is conservative and should provide good service. I like the way they made use of the PC's speaker and the fact that they included two phone jacks on the board.

The two jacks allow you to plug in a telephone without having to use a Y connector in the wall jack. (They ought to have included a volume control in the monitor amplifier because the modem sounds coming from my PC's speaker are just too loud.)

For a list price of $349, Cactus Technology will provide you with a 300-baud modem, which will fit into your PC, and the software to use it. I'm sure that either Cactus or other companies in the industry will quickly fill some of the holes in the software. When the modem board is not functioning as a modem, it serves as a normal RS-232C port.

For more information, you can contact Cactus Technology at 3024 North 33rd Drive, Phoenix, AZ 85017 (phone 602-269-2440).

They Are the First, But . . .

Wait for the deluge. If you're going to use one of the valuable expansion slots in your PC for a modem, you had better think about the features you'll want in your machine in the future.

Several manufacturers are getting ready to release modem cards for the PC with combinations of functions and 1200-baud service using Bell 212 signaling.

Ven-Tel recently displayed a prototype of an internal modem for the IBM PC that responded to the commands of the Hayes Smartmodem. This kind of device would have 100 percent compatibility with most software packages being marketed for the PC.

Other companies in the quad and multiboard business will be there soon. There should be enough combinations of modems, memory, ports and functions to make your head spin.

You'll need to consider where you are going with your machine; the modem makers will need to provide you with increments of growth to help you get there in an affordable manner.

Can You Chronograph?

A few months ago, I asked for ideas and inputs on what you do with a Hayes Chronograph.

For those of you who may not be familiar with it, the Chronograph is a digital clock that has a visual display and an RS-232C interface. It's designed to sit under a Hayes Smartmodem and to pass the time, date and day of the week to a host computer or other digital device. The clock is set through the serial port and there are no manual controls except for a write-protect switch.

I wanted to see if anyone had come up with any special uses for this device. I was puzzled by the need for a second serial port to use the clock and found that with a list price of more than $200, it made an expensive timepiece for the computer room.

Listing 1. Hayes Stack Chronograph program.

```
10 REM HAYES STACK CHRONOGRAPH PROGRAM by R.E. Glotzbach
20 OPEN "COM2:" AS #1
30 CLS
40 PRINT TAB(20) "HAYES STACK CHRONOGRAPH PROGRAM"
50 PRINT: PRINT
60 PRINT TAB(10) "1  ATDT -- Display Time"
70 PRINT TAB(10) "2  ATDD -- Display Date"
80 PRINT TAB(10) "3  ATRT -- Read Time"
90 PRINT TAB(10) "4  ATRD -- Read Date"
100 PRINT TAB(10) "5  ATRW -- Read Weekday"
110 PRINT TAB(10) "6  ATLS -- Line Feed Set"
120 PRINT TAB(10) "7  ATLC -- Line Feed Clear"
130 PRINT TAB(10) "8  ATVT -- Time Separator Set"
140 PRINT TAB(10) "9  ATVT -- Time Separator Clear"
150 PRINT TAB(9) "10  ATVD -- Date Separator Set"
160 PRINT TAB(9) "11  ATVD -- Date Separator Clear"
170 PRINT TAB(9) "12  ATST -- Set Time"
180 PRINT TAB(9) "13  ATSD -- Set Date"
190 PRINT TAB(9) "14  ATSW -- Set Weekday"
200 PRINT TAB(9) "15  ATAS -- Alarm Set"
210 PRINT TAB(9) "16  ATAC -- Alarm Clear"
220 PRINT TAB(9) "17  END PROGRAM"
230 PRINT: INPUT "CHOICE";CHOICE
240 IF (CHOICE 1)OR(CHOICE 17) THEN BEEP: PRINT "BAD CHOICE
      NUMBER":  FOR I=1 TO 500: NEXT I: GOTO 30
250 ON CHOICE GOSUB
1000,2000,3000,4000,5000,6000,7000,8000,9000,10000,11000,
    12000,13000,14000,15000,16000,17000
260 GOTO 20
1000 REM   ATDT -- Display Time
1010 CLS
1020 PRINT TAB(20) "ATDT -- Display Time"
1030 PRINT: PRINT
1040 INPUT " enter ATDT' to display the time";A$
1050 IF A$  "ATDT" THEN BEEP: PRINT "TRY AGAIN": FOR I=1 TO 200:
     NEXT I: GOTO 1000
1060 PRINT#1,A$
1065 CLOSE#1
1070 RETURN
2000 REM   ATDD -- Display Date
2010 CLS
2020 PRINT TAB(20) "ATDD -- Display Date"
2030 PRINT: PRINT
2040 INPUT "enter ATDD' to display the date";B$
2050 IF B$  "ATDD" THEN BEEP: PRINT "TRY AGAIN": FOR I=1 TO 200:
    NEXT I:   GOTO 2000
2060 PRINT#1,B$
2065 CLOSE#1
```

More

Listing continued.

```
2070 RETURN
3000 REM   ATRT -- Read Time
3010 CLS
3020 PRINT TAB(20) "ATRT -- Read Time"
3030 PRINT: PRINT
3040 INPUT "enter ATRT' to read the time";C$: PRINT
3050 IF C$  "ATRT" THEN BEEP: PRINT "TRY AGAIN": FOR I=1 TO 200:
     NEXT I:  GOTO 3000
3060 PRINT#1,C$
3070 INPUT#1,C1$: C2$="THE TIME IS": CLS
3080 PRINT C2$,C1$: PRINT: PRINT "enter CONT' to return to menu": PRINT:
3090 CLOSE #1
3100 RETURN
4000 REM   ATRD -- Read Date
4010 CLS
4020 PRINT TAB(20) "ATRD -- Read Date"
4030 PRINT: PRINT
4040 INPUT "enter ATRD' to read the date";D$: PRINT
4050 IF D$  "ATRD" THEN BEEP: PRINT "TRY AGAIN": FOR I=1 TO 200:
      NEXT I:  GOTO 4000
4060 PRINT#1,D$
4070 INPUT#1,D1$: D2$="THE DATE IS": CLS
4080 PRINT D2$,D1$: PRINT: PRINT "enter CONT' to return to menu": PRINT:
4090 CLOSE#1
4100 RETURN
5000 REM   ATRW -- Read Weekday
5010 CLS
5020 PRINT TAB(20) "ATRW -- Read Weekday"
5030 PRINT: PRINT
5040 INPUT "enter ATRW' to read the weekday";E$: PRINT
5050 IF E$  "ATRW" THEN BEEP: PRINT "TRY AGAIN": FOR I=1 TO 200:
     NEXT I: GOTO 5000
5060 PRINT#1,E$
5070 INPUT#1,E1: E2$="THE WEEKDAY IS": CLS
5080 PRINT E2$;E1;
5090 IF E1=0 THEN PRINT "(MONDAY)"
5100 IF E1=1 THEN PRINT "(TUESDAY)"
5110 IF E1=2 THEN PRINT "(WEDNESDAY)"
5120 IF E1=3 THEN PRINT "(THURSDAY)"
5130 IF E1=4 THEN PRINT "(FRIDAY)"
5140 IF E1=5 THEN PRINT "(SATURDAY)"
5150 IF E1=6 THEN PRINT "(SUNDAY)"
5160 PRINT: PRINT "enter CONT' to return to menu": PRINT: STOP
5170 CLOSE#1
5180 RETURN
6000 REM   ATLS -- Line Feed Set
6010 CLS
6020 PRINT TAB(20) "ATLS -- Line Feed Set"
6030 PRINT: PRINT
6040 INPUT "enter ATLS' to set the line feed";F$
6050 IF F$  "ATLS" THEN BEEP: PRINT "TRY AGAIN": FOR I=1 TO 200:
     NEXT I: GOTO 6000
6060 PRINT#1,F$
6070 INPUT#1,F1$
6080 PRINT: PRINT "The line feed is set."
6090 PRINT: PRINT "enter CONT' to return to menu"
6100 STOP
6110 CLOSE#1
6120 RETURN
7000 REM   ATLC -- Line Feed Clear
7010 CLS
7020 PRINT TAB(20) "ATLC -- Line Feed Clear"
7030 PRINT: PRINT
7040 INPUT "enter ATLC' to clear the line feed";G$
7050 IF G$  "ATLC" THEN BEEP: PRINT "TRY AGAIN": FOR I=1 TO 200:
      NEXT I:  GOTO 7000
7060 PRINT#1,G$
7070 INPUT#1,G1$
7080 PRINT: PRINT "The line feed is cleared."
7090 PRINT: PRINT "enter CONT' to return to menu"
7100 STOP
7110 CLOSE#1
7120 RETURN
8000 REM   ATVT -- Time Separator Set
8010 CLS
8020 PRINT TAB(20) "ATVT -- Time Separator Set"
8030 PRINT: PRINT
8040 INPUT "enter ATVT:' to set the time separator as a colon
     mark";H$
8050 IF H$  "ATVT:" THEN BEEP: PRINT "TRY AGAIN": FOR I=1 TO
     200: NEXT I: GOTO 8000
8060 PRINT#1,H$
8070 INPUT#1,H1$
8080 PRINT: PRINT "The time separator is set."
8090 PRINT: PRINT "enter CONT' to return to menu"
8100 STOP
8110 CLOSE#1
8120 RETURN
9000 REM   ATVT -- Time Separator Clear
9010 CLS
9020 PRINT TAB(20) "ATVT -- Time Separator Clear"
9030 PRINT: PRINT
```

More →

I received several reports on how people Chronograh, but two stood out from the rest because of the clarity of their writing and the usefulness of their programs.

Kind of a Quick Chronograph

Dr. Raymond Glotzbach of Memphis, TN, provided two programs written in Microsoft Basic and designed for use on the IBM PC. The first program (Listing 1) is a kind of quick Chronograph tutorial. The program prompts you to make the proper entries while ensuring that you know what the clock is doing. This concept of an on-line tutorial is excellent and it would make a nice addition to the Hayes documentation.

Note that in line 20 of the first program, the Chronograph is assigned to the second RS-232C port (COM 2) in the PC. Lines 60–220 list a menu containing the various functions of the Chronograph. The various subroutines show the user how to enter the Chronograph commands.

The second short program (Listing 2) loads the time and date from the Chronograph into the DATE$ and TIME$ functions of IBM PC Basic. This little program can be included in an Autoexec.bat file (don't forget to call Basic) to load the date and time into the system during start-up.

Automatic Data Calls

A second descriptive letter came from Al Heigl in Minneapolis, MN. Heigl describes how he used a Chronograph to build a system that automatically makes data calls every morning; the system collects information for a small business chain that uses the Heath H-89.

Heigl had to write some CP/M program modules to deal with the time values and to read the alarm signals of the Chronograph. He reports that he also has written a module that causes the Condor DBMS to pause and interrogate the Chronograph and he credits Condor for providing information on how to patch their software.

In commenting on the Chronograph itself, Heigl wishes for an autodimming feature that would adjust the brightness of the display to the room light. I second that motion, but I would also vote for a relay to control external functions when the alarm goes off and for some way to daisy-chain the Chronograph with a Smartmodem or another RS-232C device.

As the two devices are presently configured, it is technically possible to connect a Chronograph and a Smartmodem to the same RS-232 line using diode isolation, but operationally the devices would issue conflicting "Error" messages when one or the other was addressed.

The alarm function of the Chronograph also causes some confusion. This is unfortunate, since the alarm is one

Listing continued.

```
9040 INPUT "enter ATVT' to clear the time separator";I$
9050 IF I$  "ATVT" THEN BEEP: PRINT "TRY AGAIN": FOR I=1 TO 200:
     NEXT I:  GOTO 9000
9060 PRINT#1,I$
9070 INPUT#1,I1$
9080 PRINT: PRINT "The time separator is cleared."
9090 PRINT: PRINT "enter CONT' to return to menu"
9100 STOP
9110 CLOSE#1
9120 RETURN
10000 REM   ATVD -- Date Separator Set
10010 CLS
10020 PRINT TAB(20) "ATVD -- Date Separator Set"
10030 PRINT: PRINT
10040 INPUT "enter ATVD/' to set the date separator as a slash";J$
10050 IF J$  "ATVD/" THEN BEEP: PRINT "TRY AGAIN": FOR I=1 TO
     200: NEXT I:  GOTO 10000
10060 PRINT#1,J$
10070 INPUT#1,J1$
10080 PRINT: PRINT "The date separator is set."
10090 PRINT: PRINT "enter CONT' to return to menu"
10100 STOP
10110 CLOSE#1
10120 RETURN
11000 REM   ATVD -- Date Separator Clear
11010 CLS
11020 PRINT TAB(20) "ATVD -- Date Separator Clear"
11030 PRINT: PRINT
11040 INPUT "enter ATVD' to clear the date separator";K$
11050 IF K$  "ATVD" THEN BEEP: PRINT "TRY AGAIN": FOR I=1 TO
    200: NEXT I: GOTO 11000
11060 PRINT#1,K$
11070 INPUT#1,K1$
11080 PRINT: PRINT "The date separator is cleared."
11090 PRINT: PRINT "enter CONT' to return to menu"
11100 STOP
11110 CLOSE#1
11120 RETURN
12000 REM   ATST -- Set Time
12010 CLS
12020 PRINT TAB(20) "ATST -- Set Time"
12030 PRINT: PRINT
12040 INPUT "enter ATSThhmm00' to set time, ex. ATST235959";L$
12050 PRINT#1,L$
12060 PRINT
12070 PRINT "Check chronograph for new time. Is write-protect
          switch off?"
12080 PRINT: PRINT "enter CONT' to return to menu"
12090 STOP
12100 CLOSE#1
12110 RETURN
13000 REM   ATSD -- Set Date
13010 CLS
13020 PRINT TAB(20) "ATSD -- Set Date"
13030 PRINT: PRINT
13040 INPUT "enter ATSDyymmdd' to set date, ex. ATSD821231";M$
13050 PRINT#1,M$
13060 PRINT
13070 PRINT "Check chronograph for new date. Is write-protect
      switch off?"
13080 PRINT: PRINT "enter CONT' to return to menu"
13090 STOP
13100 CLOSE#1
13110 RETURN
14000 REM   ATSW -- Set Weekday
14010 CLS
14020 PRINT TAB(20) "ATSW -- Set Weekday"
14030 PRINT: PRINT
14040 INPUT "enter ATSWd' to set weekday, ex. ATSW0, where
      0=MONDAY, 1=TUESDAY, 2=WEDNESDAY, 3=THURSDAY, 4=FRIDAY,
      5=SATURDAY, 6=SUNDAY";N$
14050 PRINT#1,N$
14060 PRINT
14070 PRINT "Check chronograph for new day. Is write-protect
      switch off?"
14080 PRINT: PRINT "enter CONT' to return to menu"
14090 STOP
14100 CLOSE#1
14110 RETURN
15000 REM   ATAS -- Alarm Set
15010 CLS
15020 PRINT TAB(20) "ATAS -- Alarm Set"
15030 PRINT: PRINT
15040 INPUT "enter ATAShhmm to set alarm, ex. ATAS2359";O$
15050 PRINT#1,O$
15060 INPUT#1,O1$
15070 PRINT O1$
15080 PRINT: PRINT "The alarm is set."
15090 PRINT: PRINT "enter CONT' to return to menu": STOP
15100 CLOSE#1
15120 RETURN
16000 REM   ATAC -- Alarm Clear
16010 CLS
```

More

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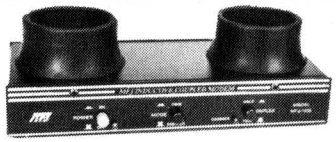

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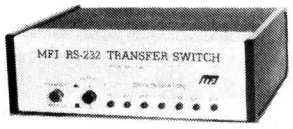

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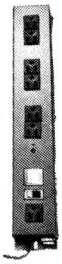

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Listing continued.

```
16020 PRINT TAB(20) "ATAC -- Alarm Clear"
16030 PRINT: PRINT
16040 INPUT "enter ATAC to clear alarm, ex. ATAC";P$
16050 PRINT#1,P$
16060 PRINT: PRINT "The alarm is cleared."
16070 PRINT: PRINT "enter CONT' to return to menu"
16080 STOP
16090 CLOSE#1
16100 RETURN
17000 REM    END PROGRAM
17010 CLOSE #1: END
```

```
5 CLS:KEY OFF
10 OPEN "COM2:1200,N,8,1" AS 1
20 OST$="ATVD-":GOSUB 100
30 OST$="ATVT:":GOSUB 100
40 OST$="ATRD":GOSUB 100:DT$=IST$
50 OST$="ATRT":GOSUB 100:TM$=IST$:GOTO 200
100 PRINT#1,OST$
110 INPUT#1,IST$
120 RETURN
200 DTE$=MID$(DT$,4,5)+"-"+LEFT$(DT$,2)
210 DATE$=DTE$
220 TIME$=TM$
230 LOCATE 1,1:PRINT DATE$
240 LOCATE 1,72:PRINT TIME$
250 SYSTEM
```

Listing 2. This short program, written in IBM PC Basic, loads the date and time from a Hayes Chronograph into the PC's programmed date and time functions.

function that sets the Chronograph apart from other hardware clocks installed internally in computer systems.

When the alarm goes off, the Chronograph gives an indication on the digital display, sends the letter A down the data line and turns on the ring line (pin 22) on the RS-232C line. This ring line can be tested on machines like the IBM PC by examining the modem status register.

If you have software that checks other status registers, such as Clear To Send (CTS), you could configure the cable connecting your computer and the Chronograph so the ring indicator (pin 22 on the Hayes) is tested by the CTS (pin 5 on your computer). You could simply divert the wire from pin 22 to pin 5 on the computer end of the cable.

In this way, communications programs that test for CTS could be used to indicate the alarm. Another alternative would be a small program that looks for the letter A coming into the serial port and then proceeds to other functions.

The Hayes Chronograph can be a useful tool where an internal hardware clock is not available, where you need an alarm function or where you simply want to include a visual display of the time and date.

We can wish that more commercial software packages would provide the option of interrogating a Chronograph for the date and time, but in the meantime we will have to rely on people like Al Heigl and Raymond Glotzbach to supply the answers.

Both of these gentlemen will be receiving a copy of my book *Microcomputer Data Communications* for providing us with information on how they Chronograph.

* * *

Info Needed

If you market data communications products or if you have an idea for a product that you wish someone would make, let me know. You can use the address accompanying this column or drop me an electronic line through TCB967 on the Source or 70003,455 on CompuServe.□

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11205	20	.20	.18	.16
11206	22	.22	.20	.18
11207	24	.24	.22	.20
11208	28	.28	.26	.25
11209	40	.40	.37	.33

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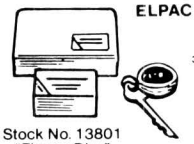

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13835	CL3804	4.0-7.0	28±1.4	50	.651x1.2x1.77	24.95
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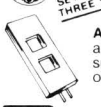

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13809	SOLV30-12	12	4.0A	5-5/8x4-7/8x3-3/16	OVP-4	59.95
13810	SOLV30-15	15	3.3A	5-5/8x4-7/8x3-3/16	OVP-4	59.95
13812	SOLV30-24	24	2.0A	5-5/8x4-7/8x3-3/16	OVP-4	59.95
13802-1	Data Sheet for SOLV Series ..... .25					

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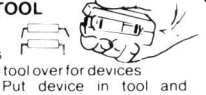

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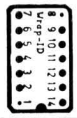

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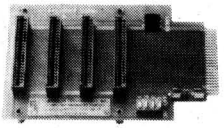

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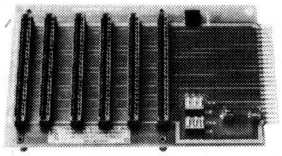

6 Slot for the VIC. Toggle switches and reset switch.
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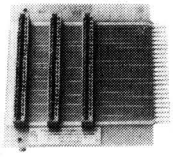

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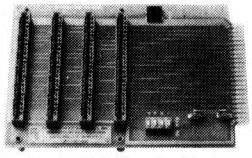

4 Slot for the VIC. Toggle switches and reset switch.
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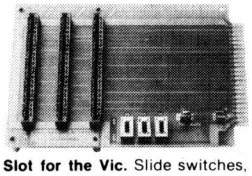

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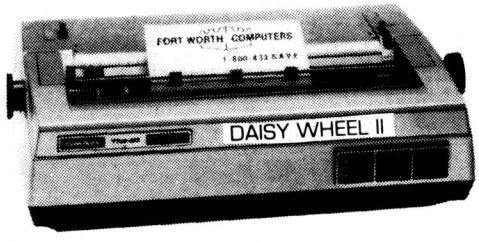

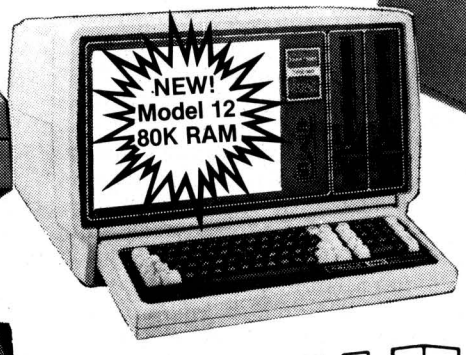

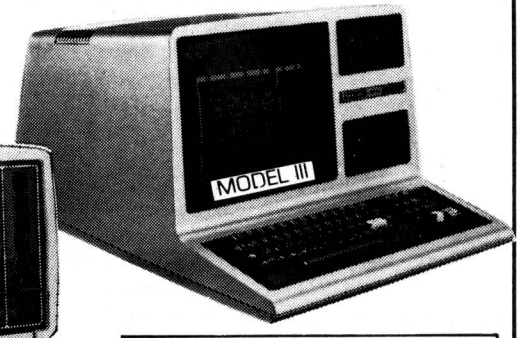

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By Robert W. Baker

A Haven Of Hardware

HHC-4 Leads Latest from Commodore

Tons of new product announcements have been rolling in on the heels of the Consumer Electronics Show in Las Vegas (January 6–9). The news includes details on Commodore's latest hardware: a new handheld computer, a new color monitor and a new color printer/plotter.

Besides covering those developments, we'll also look at Rompacker (a new way to save programs for the VIC-20).

Commodore News From CES

A flurry of press releases has filled in the details of what's coming from Commodore. Several new microcomputer systems, a number of new microcomputer peripheral devices and several new software packages were announced at the Consumer Electronics Show.

Among the not-yet-released microcomputer systems to be introduced are three new portables, each of which has 64K of built-in RAM. All three systems have built-in, five-inch television display monitors; two of the systems are in color. They also have one or two built-in floppy disk drives with 170K mass storage per drive.

All three systems "will have compatibility with the Commodore-64 personal computer" in the areas of software and peripherals, according to a Commodore spokesman.

The price of each machine is said to be substantially below any comparable product now on the market. Each system, depending upon its configuration, is expected to cost between $995 (for a system with a built-in, five-inch monochrome display monitor and single disk drive) and $1495 (for a system with a built-in, five-inch color display monitor and dual disk drives). Initial shipments are expected in April or May.

Address correspondence to Robert W. Baker, 15 Windsor Drive, Atco, NJ 08004.

As a result of the extraordinary demand for the Commodore-64 personal computer, Commodore is expanding its channels of distribution to include several of the largest mass merchandisers in the world. At the same time, the previously announced P-128 systems were to have started shipping through the regular computer dealer network.

The P-128 is part of the new P500 series of microcomputers and is being called the Commodore-128. It was first announced at $995, but the suggested retail price is now $795.

In Good Hands With Commodore

Commodore also announced a handheld computer/calculator. The HHC-4 can be used as a portable computer and full-function calculator, or it can be connected to a television for full-screen computing. The HHC-4 forms the nucleus of a portable computer system that's easy to use and compact enough to carry in a briefcase.

Memory starts at 4K of RAM and is easily expanded to 16K with the addition of a plug-in memory expansion cartridge. The computer contains a powerful 20K ROM operating system that supports the built-in Basic computing language as well as special calculator functions.

The HHC-4 can be operated as a calculator with the flick of a switch. In addition, all numeric functions and variables contained in Basic can be utilized.

The compact computer has a standard QWERTY keyboard and a separate calculator keypad. One-stroke Basic functions make the HHC-4 especially easy to program. Information can be viewed on a built-in, 24-character liquid display or on a standard television or monitor with the addition of a TV interface.

A combination miniprinter and peripheral interface provides fast, silent printing at 24 characters per second. Larger dot matrix printers can be optionally connected. An RS-232 interface connects the HHC-4 to other Commodore personal computers to provide a portable extension of more powerful information-processing and retrieval systems.

The computer itself is powered by three AA batteries that provide 300 hours of operation. So far there has been no mention of exact size, pricing or expected delivery date, so we'll just have to wait and see.

CBM-1701 Color Monitor

A low-priced color monitor, the CBM-1701, was also introduced; it's designed especially for use with the Commodore-64 and VIC-20. The new 13-inch monitor, which will sell for $299.95, accepts a standard 75-ohm composite video signal or a "Commodore" video signal, with separate provisions for luminance and chrominance signal input as well as audio input.

The monitor was developed in conjunction with a major television manufacturer and includes special circuitry that greatly enhances picture resolution. Commodore even has applied for a patent on the new design. The CBM-1701 should be available by the time you read this.

Unveiling of a Printer/Plotter

The final hardware-related announcement at CES involved the new color CBM

1520 Printer/Plotter, priced at $199.95. The accessory uses 4½-inch roll paper and prints in four colors (or combinations) to achieve multicolored graphs, charts and illustrations.

High-resolution illustrations are achieved by the Printer/Plotter's ability to step 480 dots horizontally and up to 999 dots vertically.

Four separate ball-point ink pens provide a clean, high-quality color image, and the five-inch-wide carriage accommodates standard roll paper. The device is said to be easily programmed from Basic and requires no special modification to use.

Software With Personality

Commodore introduced a series of software products for the VIC-20. These releases resemble paperback books in theme, packaging and content.

The first five titles in this series are Know Your Personality, Know Your IQ, Know Your Child's IQ, Robert Carrier's Menu Planner and Quizmaster.

All programs include a booklet and computer tape cassette(s) and were developed for Commodore by recognized experts in their fields. For example, Quizmaster was developed to let you design your own tests for use in classrooms, parties and trivia contests.

You'll also get to meet Gortek, a new robot-like character who helps children learn to program via a unique series of books and cassette tapes. The first title in the series is called Gortek and the Microchips; it'll be available for both the C-64 and the VIC-20.

Gortek and the Microchips is designed for children under age 14. It consists of two cassette tapes containing 12 educational programs and a colorful glossy instruction book, which reads like a comic book but teaches the fundamentals of Basic. The book includes imaginative full-color illustrations and large type and is written for use by older children or younger children with parental assistance.

As the story goes, the planet Syntax is being invaded by the fearsome Zitrons. Gortek is working furiously to teach the Microchips to program the computer to repel attack. The "Microchips Training Manual" teaches the child how to help stop the Zitrons. Those who complete the lessons and successfully fend off the Zitrons earn the right to wear the Gortek badge, which comes in the package; at the same time, they learn some computer programming.

This innovative approach to computer education was developed by three British schoolteachers who wanted to make programming fun to learn.

New Manuals

A number of new manuals are being prepared in addition to the current programmer's reference guides for the VIC-20 and C-64. Look for the titles *Making Music on the C-64*, *CP/M for the Commodore-64* and *Introduction to Basic* (parts I and II).

Rompacker System

Here's a new VIC-20 product that's worth trying. Rompacker provides a new and fascinating way to store programs for your VIC-20. It's ideal for situations where the VIC is used in a dedicated application—if you constantly use one program or a series of programs.

The Rompacker system consists of two printed circuit boards and special supporting software. One of the circuit boards is the Rompacker EP-24 EPROM Programmer, which is all the hardware you need to program 2532 EPROMs.

The other circuit board is the Rompacker EE-24 User Cartridge, which allows the programs saved by the Eprom Programmer to be loaded back into VIC-20 RAM. The special software provided on EPROM contains all the programs you need to program EPROMs and to run programs saved in EPROM.

Simple Saving

Saving Basic programs in EPROM is simple. Once the program is loaded into RAM from tape or disk, a simple SYS command passes control to the Rompacker routines for saving the program on EPROM.

The program is fully prompting, asking for an EPROM to be inserted and then for the program name to be associated with the saved program on EPROM. It takes less than one minute per K of length to save the program onto the EPROM.

You can save more than one program within a single EPROM if the program sizes are relatively small. Larger programs can be saved, if required, by using multiple EPROMs. When more than a single EPROM chip is required, the program will prompt for the additional chips to be inserted on the programmer board.

When saving programs onto EPROM, the Rompacker software first checks the EPROM. If it's not entirely clear, you'll be notified and you'll have the option to continue. However, there must be at least 256 bytes clear in order to use any EPROM. All data saved on EPROM is verified and any write errors are indicated.

The Rompacker User Cartridge has sockets for six 2532 EPROMs. Each 2532 chip holds 4096 bytes (4K), giving 24K total capacity on a single User Cartridge. A special machine-language program called Autoload is contained in the first 1K of the first EPROM on the User Cartridge. The program is automatically activated whenever the VIC-20 is turned on.

Autoload searches the memory contained on the User Cartridge for programs stored with a special header. This header is created automatically when you save a program via the Rompacker system.

On powerup, these headers allow Autoload to find the names and memory locations of programs saved in EPROM; then you can select the desired program to load and run. Up to seven programs at a time will be displayed in menu form. If there are more than seven programs in the EPROMs, pressing the space bar will show the next seven programs found. Pressing the return key causes the menu to restart from the beginning.

If any program is named Auto, it immediately will load and run when found by the Autoload program—without displaying the program menu. Otherwise, to run a specific program, simply enter the correct number key for the desired program. That program will be loaded into the computer's RAM virtually instantly and will start to run. The actual load time is less than a tenth of a second.

The Autoload program also provides for one program to call another program to be loaded. In some cases, the variables of the calling program can be used by the called program. This capability allows you to create, in modular form, large programs that move in and out of RAM memory—almost like Virtual Memory systems on large computers.

Special Block Commands

In addition to saving programs onto EPROMs for Rompacker User Cartridges, the Rompacker System allows you to do many of the normal things that other EPROM programmers are designed for.

Special block commands allow you to test an EPROM to see if it is clear, to read an EPROM into VIC RAM, to verify EPROM contents against RAM data and to write an EPROM from VIC RAM.

Additional one-key commands are available to copy any of the socketed EPROMs on the user cartridge for the purpose of easily duplicating that cartridge. You can even save machine-language programs on EPROM if you want to.

The Rompacker is an excellent addition for the dedicated hobbyist or hacker. Documentation is good and the boards are well-made. The only drawback to using the Rompacker system is that you cannot add more than 8K of additional RAM to the basic VIC-20 system when using the User Cartridges.

Cost of the complete Rompacker Starter System is $179.95. This includes the EP-24 EPROM Programmer, EE-24 User Cartridge, three 2532 EPROMs (one blank and two programmed with Rompacker programs) and a manual.

Additional EE-24 User Cartridges are $39.95 each and include one 2532 EPROM with the Autostart Menu program. For more information, contact Business Computer Systems of New England, PO Box 2285, Springfield, MA 01101.□

LETTERS TO THE EDITOR

No Such Character?

I have recently become a devotee of *Microcomputing*. The reason for my conversion is that you publish programs that will run on my VIC-20.

I have, however, run across a problem that's driving me crazy. The trouble stems from The Game Room article "Survival or Shish Kebab?" (February *Microcomputing*, p. 78).

Line 430 of the Doctor Dementia program reads: 430 CX = 2 + 3*(((−1)^IX . . .

What is the symbol ^? I have used it in the French language and seen its use on the Apple computer, but there is no character like ^ on the VIC-20.

Norm Barabash
Brooklyn, NY

Reply:

Some of the letters I've received concerning my article "Survival or Shish Kebab?" (February Microcomputing, *p. 78) have indicated that users have had some difficulty in entering the program correctly. Well, the Doctor Dementia game is a big program and entering it is fairly tedious work, but it can be done. Here is one correction to the listing and some hints to ease the task.*

Line 620 has an error in it. It should read:

```
620 FORI=0TO8: Y(I)=0:PRINTCHR$(161)"
    [SPACE]";:NEXT
```

To make the program useable in VIC 20s with any amount of extra memory, change line 630 to:

```
630 PRINT"[BLACK][SPACE][HOME]";
    :POKEHB+484,173:POKEHB+505,171
```

The carret (^) symbol stands for an up-arrow, or exponentiation.

The CLR command in line 860 is the command, not the clear screen function.

Be careful and type the program in exactly as given. Type in the spaces exactly as shown, and don't mistake the number 0 for the letter O. Most user problems have been traced to mistaking a zero for an O.

I hope these suggestions will help your readers. I apologize for the error in line 620. This apparently slipped in while preparing a pleasant-looking printout.

Thomas Henry
Mankato, MN

Wanna Swap?

I found D.E. Cortesi's article on the Stopgap Editor for the IBM PC in your January issue (p. 64) very interesting. I admire his programming style.

Although I have not used the IBM Personal Computer, most other versions of Microsoft Basic include the Swap statement. I believe Mr. Cortesi's program would run quite fast and be easier to follow if he used Swap, rather than the index chains, to keep his line array in order.

In a similar application using a 4MHz Z-80, I found that Swap could easily insert a string into a 500 item array with minimal delay.

David H. Close
Canoga Park, CA

IBM's MVP Fills the Gap

Congratulations on publishing a program (IBM's MVP, *Microcomputing*, January 1983) that fills a big gap in an otherwise fine product. I have been a reader of various Wayne Green publications for more than ten years and without question this article was of more practical benefit to me than any other.

For the benefit of other readers, I have modified the program, as shown below, to add desirable features for text processing:

```
303 IF SCOL=>76 THEN BEEP: 'alert typist to end of line
305 IF SCOL=>72 AND CIN$=" " THEN GOSUB 600:
    GOTO 1330: 'word wrap
307 IF SCOL=MAXW THEN GOSUB 600: GOTO 1330:
    'line wrap-around
```

Line 305 provides a crude simulation of word wrap-around, but could be improved upon by more proficient programmers. These changes are effective only while in insert mode, not while doing line deletes, etc.

Billy B. Pinkerton,
Dhahran, Saudi Arabia

Reply:

I like Billy Pinkerton's margin-bell and line-wrap changes. I was using the Stopgap Editor to enter programs, so that sort of thing didn't occur to me.

I don't believe David Close's suggestion to use Swap would help anything. To delete the top line, you'd have to start at the top and swap every existing line up by one; to insert at the top you'd start at the bottom and swap every line down by one to make room. The chaining scheme doesn't move any lines; it just indexes a half-dozen integers.

There is one bug in the editor: it doesn't handle tabs correctly. If you use it on a file made by EDLIN, the embedded tabs bollix up the display. A crude fix is to change incoming tabs to blanks:

```
1973 FOR I=1 TO LEN(CIN$)
1975   IF ASC(CIN$)=9 THEN MID$(CIN$,I,1)=" "
1977 NEXT I
```

Finally, when I wrote the editor I was under the impression that PC Basic, like other Microsoft Basics, ran faster when frequent subroutines were at the top of the program. That is not the case! If I were doing it over I'd put the subroutines in a more readable order. I won't redo it, though, because there are scads of good PC editors on the market now.

David E. Cortesi
Palo Alto, CA

Two Corrections

Just a short note to correct two errors, one mine, one yours. In my article "VIC Invades Space" (January *Microcomputing*, p. 50), the program lines 600 and 610 should read:

```
600 N1(M)=N1(M−1)+S1: GOTO 620
610 N1(M)=N1(M−1)+S1+40
```

The article byline should have read Gabriel & John Franke.

Gabriel & John Franke
Norfolk, VA

Looking for the Connection

I would like to know if one of your advertisers or readers knows of a connecting device (plugs and wires) that would allow me to join my Commodore VIC-20 with my own cassette tape recorder.

Commodore makes a "Datassette" for $75, but I understand some small computers can operate with any tape player. I want to know if this is possible with the VIC-20.

Robert Wayne Taylor
1438 Dunn Parkway
Mountainside, NJ 07092

Ooops . . .

After my article on the risk of heart disease was published (January *Microcomputing*, p. 48), I learned that I incorrectly credited the original idea of the matrix to the wrong newsletter. I should have given credit to the *Executive Fitness Newsletter*, published by Rodale Press. My apologies to the good people at Rodale and to anyone who had difficulty checking my reference.

D. C. Shoemaker
APO NY

Seeking Words of Advice

Each month I thoroughly enjoy Tom Bonoma's "What's New, Big Blue?" column in *Microcomputing*. Unfortunately I now have a problem with my IBM Personal Computer and need advice.

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- IBM monochrome display and adapter.
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This system is used in an engineering program office at Sanders. At the present time, with the IBM display, I cannot use programs such as Visitrend/Visiplot even with the IBM Graphics Adapter Card.

The high resolution of the IBM CRT is outstanding for VisiCalc usage. I hate to lose this resolution, but need to use the graphics programs.

Discussions with local Computerland personnel, who are extremely helpful, have not yet yielded a solution.

Possibilities considered have included:

- Hercules adapter card. Not thought to support VisiCalc.
- Orchid Technology adapter card. Unknown capability.
- ABM Color to Monochrome Interface Cable Module. Unknown capability, particularly for VisiCalc, but sounds too good to be true.
- Amdek Color II Monitor. Would support graphics but not as good for VisiCalc as IBM Monochrome. Solution of having two displays on my desk is not desirable.

Somehow I have to find a way to get both graphics and high resolution from the same display, hopefully using the IBM Monochrome that I already have.

I am interested in comments on the above possibilities or suggestions on alternatives.

John P. Keegan
Sanders Associates, Inc.
95 Canal Street
Nashua, NH 03060

```
Ok
list
5 'This is VARLINE
10 'Calculate GOTO 'X'
20 FOR L=24000 TO 65536!'Find 'X'
30 IF PEEK(L)=14
  AND PEEK(L+1)=44
  AND PEEK(L+2)=1 THEN 60
40 NEXT L
60 PRINT "Location=" L'L=Location
70 X=400'Set Variable
120 POKE L,14
130 H=X\256:LO=X-H*256'High & Low values
140 POKE L+1,LO:POKE L+2,H
150 GOTO 300'300 is dummy 'X'
400 PRINT"Location found."
410 X=500:GOSUB 120
420 LIST
500 PRINT"Routine tested successfully.":RETURN
Ok
lprint:lprint:run
```

Fig. 1. Program stimulated by Robert W. Blake's "A Super Shortcut."

```
Location= 24834
Location found.
Routine tested successfully.
5 'This is VARLINE
10 'Calculate GOTO 'X'
20 FOR L=24000 TO 65536!'Find 'X'
30 IF PEEK(L)=14
  AND PEEK(L+1)=44
  AND PEEK(L+2)=1 THEN 60
40 NEXT L
60 PRINT "Location=" L'L=Location
70 X=400'Set Variable
120 POKE L,14
130 H=X\256:LO=X-H*256'High & Low values
140 POKE L+1,LO:POKE L+2,H
150 GOTO 500'300 is dummy 'X'
400 PRINT"Location found."
410 X=500:GOSUB 120
420 LIST
500 PRINT"Routine tested successfully.":RETURN
Ok
```

Fig. 2. Result after running the program in Fig. 1.

Finding Lost Addresses

Robert W. Blake's article "A Super Shortcut" (February *Microcomputing*, p. 16) stimulated the enclosed program (see Figs. 1 and 2). Microsoft's MBasic, like Commodore systems', has no computed goto (or gosub) command.

Such a command can be written but there are distinct differences from the method used by Mr. Blake. One difference stems from the fact that MBasic encodes object addresses in machine language (i.e., low-order byte and then high-order byte). Knowing this, we can write a GOTO 300 line and convert the 300 into a low-order byte of 44 while the high-order byte will be 1.

MBasic precedes the address with a byte of value 14. This knowledge allows us to write a program to find the memory addresses at which the low and high-order bytes are placed. Lines 20 through 40 do just that in the present program.

Lines 120 through 150 take the value found in the variable X, reduce it to low- and high-order bytes, and poke the bytes into the proper memory locations. The goto then executed will be to the line whose value was found in the variable X.

Should the line called be followed by a return command, it becomes expedient to compute that line's number, place the value in X and then execute a GOSUB 120 as illustrated in line 410.

The program was loaded and listed as in Fig. 1. It was then run.

The result is seen in Fig. 2. Location of the address prefix (14) was at RAM location 24834, which line 60 caused to be printed. X was set to 400 and this caused line 150 to be changed from GOTO 300 to GOTO 400. "Location found." was then printed out as seen in Fig. 2.

Line 410 set X equal to 500 and called the subroutine at line 120. Line 150 was now changed to GOTO 500, and, since line 500 ends with RETURN, the program returned to line 420.

Line 420 then listed the resident program. Note that line 150 now reads, "GOTO 500." The run command will go on forever without finding the location, since lines 20 through 40 are looking for 300; 500 will just not do.

E. Stanton Maxey, M.D.
Stuart, FL

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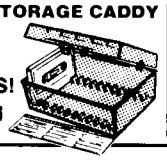

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Life in the Fast Lane With Portables

Sporting sleeker lines, easier maneuverability, lighter weight and more get-up-and-go, portables now have the microcomputerist on the run.

By Frank J. Derfler, Jr.

We live in a society that values mobility. People in North America, Japan and Western Europe are still in love with automobiles, airplanes and freedom of movement. We like portable radios, portable cassette players, portable telephones and even tummy televisions.

Consequently, the move to portable computers is logical, and it should be profitable for a growing number of microcomputer manufacturers. This article will look at where the portable trend is going and where *you* may be going with your portable.

Sizing Up a Cliché

It would be pushing a cliché to say that portable microcomputers come in all shapes and sizes, but it's true that they come with different capabilities and limitations. One person's portable may be another person's boat anchor.

Therefore, we'll need to define and classify portable micros according to specific characteristics. Then we'll see how nine different systems fit those classifications and give them a relative merit score. Finally, we'll look at how portable systems can be put to work.

The features you might look for in a portable microcomputer can be broadly divided between the physical and the operational. Physically, you ought to be able to lift the thing and carry it comfortably. It should be relatively impervious to harm and configured for easy use.

That doesn't sound like much to ask for, but most of the portables on the market weigh more than 20 pounds and some weigh nearly 30. That weight can stretch your arms pretty far on a long walk. If you're a 105-pound female, a 26-pound machine can be as comfortable for you to carry as a 50-pound bale of wet hay would be to a 200-pound male. Portability is measured in the arms of the toter.

Operationally, a portable microcomputer has to be useful once you have toted it. Several specific factors contribute to this utility: the display, the keyboard, data storage capability, appropriate applications software, input/output capabilities and the power source. We will grade these factors on a five-point scale, add points for physical portability and for dollar value and total the score (see Table 1). You probably can weigh the factors to match your own needs, but they all should be considered.

At the risk of alienating a whole subculture and getting lots of mail, I am not going to deal with the pocket portable micros. I realize that they are true computers in that they have a CPU, RAM, ROM and storage capability, but their keyboards and screen displays severely limit the scope of the things they can do.

I've composed and edited a complete article using a pocket micro be-

Scorecard

	Portability	Display	Keyboard	Software Support	Operation	Value*
Epson HX-20	5	3	4	2	5	4
Grid Compass	4	4	4	3	5	2
Teleram 3000	5	3	4	5	5	4
Osborne I	3	2	3	5	3	5
Kaypro II	3	4	5	5	5	5
Attache	4	4	5	5	5	4
Hyperion	4	4	4	5	5	3
Dot	4	4	4	5	5	4
Compaq	3	4	4	5	5	5
Corona	3	4	4	5	5	5
Colby	3	3	3	5	4	5

* Value is a subjective measure of the features and performance provided per dollar of cost.

Table 1. Portable computer evaluation on a scale of one (lowest score) to five (highest).

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fore, but it wasn't very practical and it wasn't any fun. I've also used pocket micros as portable terminals, but my fingers simply aren't pointy enough and my speed-reading isn't quick enough. So I'm going to assign the single-line display pocket portables with tiny keyboards to a separate category reserved for the Amphicar, Gyrocopter, Quadraphonic Stereo and other good ideas that haven't quite made it.

Aside from playing games, the major uses of microcomputers are for word processing, for running spreadsheets and for using file-management and database-management software. The display in a portable machine should support those functions; it should be wide enough (in terms of characters), big enough and sharp enough to be used for hours without strain.

A capability to display charts and graphs is a plus, but probably not mandatory. Flat screen displays are a definite plus for physical portability, but they may not help clarity. Some flat screens are difficult to read at various angles while others have superb clarity.

The keyboard on a portable machine is probably just as important as the display. An undersize keyboard, one with a poor tactile response, or one with a strange key arrangement (are you listening, IBM?) could spoil much of the utility of the machine. A numeric keypad is probably a plus, but cursor keys and control keys are mandatory items.

Program and file storage can be either the weakest or the heaviest link in a portable microcomputer system. Systems with no tape, disk, bubble or other long-term storage devices are severely limited in what they can do. But, systems with dual disk drives can be heavy and have large power requirements for the drive motors. These weight and power factors can limit their true portability. Certainly, the sub-four-inch disk drives now reaching the market, as well as various forms of solid state memory (RAM disk), will find heavy use in future portable microcomputer systems.

The area of applications software can be difficult to judge. If a portable system runs under CP/M or MS DOS and has a reasonably standard display, it is safe to assume that most applications can be satisfied by either a packaged program or the use of an available higher-order language. However, if a portable micro has a unique operating system, disk drive or display, then good applications software can be hard to find.

As a minimum, a portable microcomputer should have a spreadsheet program, a word processing program and at least one higher-order language (usually Basic) available. A data communications package able to capture received data and transmit files is highly desirable.

You also may need to consider software and disk format compatibility between a portable machine and other micro, mini and mainframe computer systems you use. The ability to transfer software and files from a portable to another system may be a critical factor in some applications.

The question of how well a machine can transfer data also brings up the matter of data communications and other input/output functions. Certainly a portable microcomputer system must have an RS-232C serial port to interface with local data devices and with a modem for long-distance communications over a telephone line. This is, however, one (and perhaps the only) area where the industry has

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achieved some degree of standardization. Either you have an RS-232C port or you don't, and all of our systems do.

The inclusion of a parallel port to connect to the commonly available printers is a highly rated factor. You may, however, have only a serial printer and not care about the parallel port.

Is a portable microcomputer really portable if it has to run off a 110-volt power source? Or is it merely transportable? There are many applications where it would be valuable at least to be able to run a portable computer off the 12-volt supply of an automobile. Often it would be better if the device could run from batteries for at least a couple of hours. A portable power source for portable computers sounds as if it should be an easy thing to provide, but it is either not available or not practical for most systems.

Finally, some weight must be given to the cost/value ratio of the system. How much computing power and utility are you getting for your money? The prices of the systems we are rating vary from less than $800 to more than $8000. Although it may be subjective, we need to assess how much value a system provides for the dollars spent.

The Portable Micros

Now that we have introduced the rules of the portable microcomputer game, let's see how the players shape up. Even within the portable field, there are at least four marketing positions defined by size, display, capability and price. While the products occupying those positions overlap each other, they generally sort themselves into three groups: briefcase portables, CP/M boxes and IBM PC-compatible machines.

Epson, Grid and Teleram

Group 1 consists of what I call briefcase portables. These are the most portable of the portables with full-sized keyboards; they can easily fit into a business briefcase. The major Group 1 machines are the Epson HX-20, the Teleram 3000 and the Grid Compass.

Briefcase portables can be grouped together in terms of size, weight and keyboard features, but they represent very different approaches to the market and they carry significantly different price tags.

Fast-Moving Epson

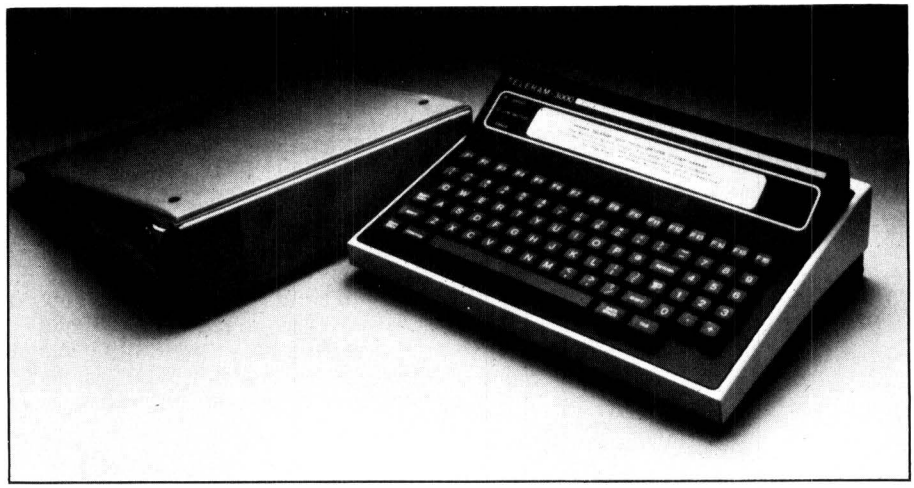
The most popular briefcase portable in terms of sales is the Epson HX-20. The Epson has two factors working for it: portability and price.

The HX-20 gives you up to 50 hours of completely portable operation with rechargeable batteries. It weighs a little less than four pounds and includes a full-size 68-key keyboard, two 6301 CPUs, a 24-column dot matrix printer, a clock, tone generator, 16K of RAM, 32K of ROM (including Microsoft Basic) and a liquid crystal screen able to display four lines containing 20 characters each. All of these features come in an 11.3×8.5×1.75-inch package bearing a list price of $795.

Options you can slide into the same package include a microcassette recorder for storing and loading programs, another 16K of RAM and another 8K of ROM. An optional battery-operated external modem will couple to any standard telephone handset and a small expansion unit will hold another 32K of mixed ROM and RAM.

The strongest points of the HX-20's display are its clarity and compactness. The 20-character-per-line limitation isn't a drawback if you're doing Basic language programming because the screen actually slides along a

Epson's briefcase-size HX-20, which sells for $795, weighs a little less than four pounds. It comes with 32K ROM and 16K RAM and a liquid crystal screen that can display up to four lines of 20 characters each.



The Teleram 3000, which is about the size of a three-inch notebook, weighs less than ten pounds. Instead of a disk drive, the Teleram has 128K (expandable to 256K) of bubble memory. The display is 80 characters by four lines.

segment of memory that is 80 characters wide.

I didn't have an opportunity to write any articles using the HX-20, so I can't attest to how well it works as a word processor. But I did take notes at a meeting by using a simple repeating input string in Basic and I found the keyboard easy to use and the screen easy to read.

Like all liquid displays, you have to position yourself properly to view the screen straight on, but I used the machine balanced on my knees, in a car and on a desk, and I found that a comfortable typing position was also a good viewing position.

The keyboard, screen and Basic can work together to produce any of 32 special graphics characters. I was surprised at the quality of graphics that could be created on a liquid crystal display. The screen has a resolution of 120 x 32 dots. The printer also has dot-addressable graphics and can reproduce the screen.

By the time this article reaches print, Epson will have word processing and spreadsheet software for the HX-20 available on cassette. The availability of Microsoft Basic means that programs written for the machines with similar Basic, from the Apple to the TRS-80, will be able to run on the HX-20.

I predict that the HX-20 will have many personalities. One of its uses will be as a portable business machine. It has great potential for operation as a portable terminal (RS-232C is built-in), and it could be a perfect training tool for young programmers and even a great "busy box" for the younger set. It's excellent for taking notes and is a wonderful traveling companion that can remind you of appointments and keep you entertained. (For more on the Epson HX-20, see p. 80.)

The Grid Compass

The Grid microcomputer from Grid Systems Corp. is a unique machine in many ways. It is uniquely styled, it has a unique operating system, it has several unique features and it has a unique price.

The Grid's suggested retail price is $8150. For that price, you're buying a Grid Compass with an 8088 16-bit processor, an 8087 arithmetic processor, 256K of RAM and 384K of bubble memory. The bubble memory serves as a long-term storage device similar to a disk drive. For software, though, you have to pay another $940.

The Grid easily fits into a slimline executive briefcase. It's a little more than two inches high and weighs just nine pounds, and its outside dimensions are 11.5 inches wide by 15 inches deep. The Grid doesn't have a carrying handle, so it's actually meant to be a briefcase portable. The cabinet is flat black and made of magnesium. The screen opens into a nice working position over the keyboard.

The Grid has a one-inch-thick, six-inch-diagonal, amber-colored screen display capable of pinpoint graphics with a resolution of 320 x 240 dots. The screen is not large, but it's so clear and the characters are so well-formed that I can honestly read text from the screen at a distance of 15 feet.

The normal text display puts 52 characters on each of 24 lines. This screen is both the strength and weakness of the system. Its size and clarity give the unit excellent portability with a nearly full screen display, but its power consumption is so high that it rules out practical battery operation.

The Grid's keyboard is closely spaced, but it has a positive feel. There are no special function keys, but the 57 keys (including a number pad) can do multiple functions when used with Grid's integrated software.

The Grid's operating system is integrated with a terminal emulation program, a text editor, a spreadsheet, an adequate database management program and a graphics program. However, the applications software is not included in the base price of the system. A one-time license for the software is $940.

The terminal emulation program is critical to the operation of the Grid system. It represents one of two ways you can get data into and out of the bubble memory.

The text editor is easy to use (it reminded me of Electric Pencil), the spreadsheet is powerful (similar to SuperCalc) and the database program is easy to use (like Condor). The graphics program can display charts and graphs on the screen or on a graphics (Epson) printer.

This "bundled" approach to the Grid operating system and applications programs allows them to use identical commands between programs, to share files completely and even to interrupt the function of one program, run another application and return to the breakpoint in the first

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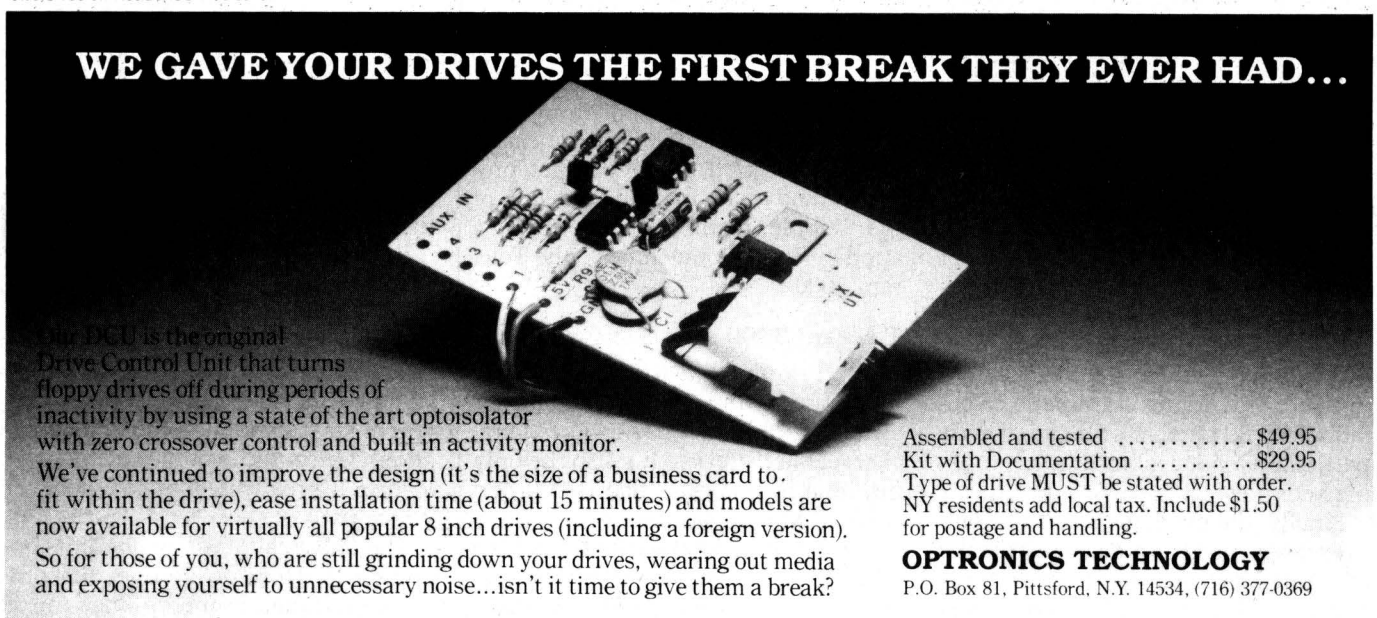

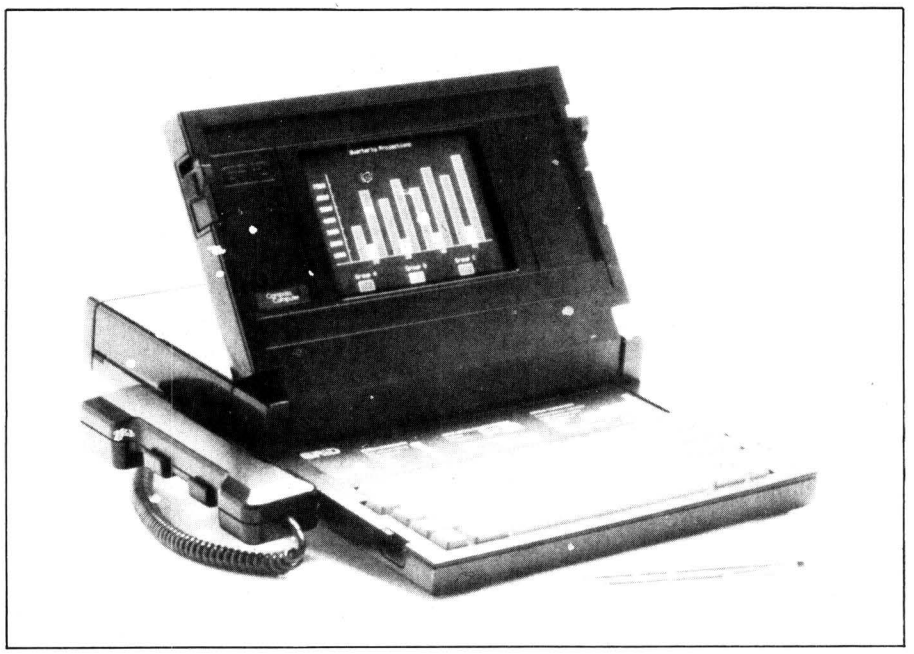

The nine-pound Grid from Grid Systems Corp. features a six-inch screen with a resolution of 320×240 dots; its text display is 24 lines by 52 characters.

program. Those are fine features if the available programs meet all of your needs.

If you have some other off-the-shelf software for 8086/8088 systems you would like to use, you're probably out of luck unless you want to pay Grid to rehost it. Except for applications you might write for yourself in Grid (Microsoft) Basic, what you see is what you get.

However, rumor-mongers around the Grid booth at the last Comdex computer show speculated that Grid soon will announce the availability of Microsoft DOS for the Compass. If this comes true, it will open the machine to the large base of software available (some software is still being developed) for the IBM PC and PC spin-offs.

I've had the opportunity to carry the Grid around and use it for my own purposes. In actual operation, three things stand out.

First, the screen display is excellent. The screen uses electroluminescent display technology and makes a beautiful presentation.

Second, the machine is fast. The 8087 coprocessor can reduce the time needed for complex arithmetic calculations by 80 percent or better. This is particularly noticeable during graphing activities.

Finally, the machine is *hot*. The outside case is used as a heat sink for the integrated circuits, so the whole thing runs very warm to the touch. I tried balancing it on my knees while I took notes during a conference and found it uncomfortably hot.

Is that significant? Probably not. Since the case is the heat sink, it's supposed to get hot. The screen draws a lot of power and the power supply is inside the small cabinet, so it's bound to get warm, but the amount of heat is surprising.

By the way, the metal construction does not produce a unit free of television interference. When I opened the screen, every television set in the house had a crosshatched picture. This is a fast and pretty machine, but it's not very clean.

I said earlier that the Compass uses a bubble memory in place of a disk. The problem with a bubble memory is that you can't just swap disks to change programs. The Grid's operational concept is different from most other machines. But before we examine the question of how to get programs and data files in and out of the bubble memory, let's examine another "bubble machine"—the Teleram 3000.

Teleram 3000

The Teleram, like the HX-20, is truly a portable machine. It can run for an average of five hours on its own rechargeable batteries. It's also the only machine in this class that is 100 percent CP/M-compatible.

The Teleram 3000 is a Z-80 machine with CP/M 2.2 built right in. The special low-power version of the Z-80 has access to 64K of RAM and 4K of ROM. Instead of a disk drive, the Teleram 3000 has 128K of bubble memory. An option brings the bubble memory up to 256K.

The Teleram 3000 neatly fits the briefcase-portable definition—it's 13 inches wide, 9.75 inches deep and 3.45 inches high, and it weighs 9.75 pounds with the batteries installed. The case is made from impact-resistant plastic. The list price of the Teleram 3000 with 128K of bubble memory is $2995. The version with 256K of bubble costs $3595.

The entire Teleram system consumes 2½ watts of power, so it can't even get as warm as the bulb in a flashlight. This low power consumption is achieved mainly through the use of a liquid crystal display. But the Teleram's LCD display does not severely limit its word processing or spreadsheet capabilities. The display is a full 80 characters wide and it presents four lines of text at a time. The display can be scrolled up and down a 24-line display memory, so the machine "thinks" it has a normal terminal display screen.

I found the display easy to read in both low and bright lighting. The screen adjusts to one of five different viewing angles to avoid the problem of liquid crystal blank-out. You can't put on conference-table graphics displays with this system like you can with the Grid, but the Teleram serves well as a personal portable. I've written and edited text on this machine and I liked it. Four lines of display are enough to allow comfortable editing, but anything less would be insufficient.

The Teleram 3000 keyboard is excellent. It includes 16 special-function keys, a number keypad, and lighted caps lock and shift lock keys. The backspace key is located next to the space bar and I found that a little strange, but the dual shift keys, extra-size return key and professional feel of the keyboard make up for it.

Functionally, the Teleram is a Z-80 CP/M computer. It will allow you to run the standard library of CP/M software in the back seat of an automobile, in a field or up a tree. It can be connected easily to the electronic system of an automobile for mobile operation. Once the bubble memory is loaded, it's ready to operate whenever you are.

The only real question about its operation is: How do you get the programs and data in there? Since this is the same question we asked about the

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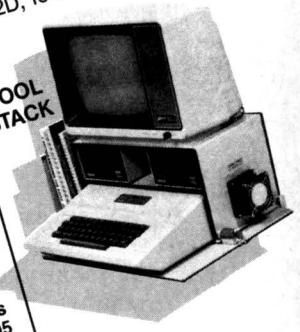

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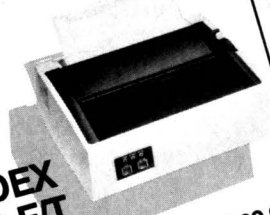

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Grid, let's see how each system solves the problem.

Loading a Bubble Machine

A magnetic bubble memory is an expensive serial storage device. In operation, it acts more like a tape than a disk. If you want to find a specific program, you have to run all of the data out of the bubble (and back in the other end) until you find what you want. Its advantages are its semipermanent storage (the magnetic poles stay locked even when the power is off), ruggedness and small size.

The bubble memories used in the Grid (384K) and Teleram (256K) can store several programs and data files, but they don't provide enough storage to keep an active user happy for long. And because of its high cost, you can't just throw in a new bubble pack when you want a new program or data file. You have to load the bubble from an external source.

Feeding the Bubbles

There are two ways to move data in and out of the bubble memory systems in the Grid and Teleram computers: through the system bus and through the serial port.

Grid has been pushing a national computer service called Grid Central Service. With this concept, Grid users can transmit data files to the Grid Service and store them there for a fee. When the user needs to use a different program, the latest version can be downloaded from the central service (for a fee).

This concept is complemented by the presence of a modem and telephone interface within the Grid Compass. Apparently, Grid users have been slow to accept the centralized service, because Grid seems to have moved toward the concept used by Teleram: the central station.

The Teleram Office Station is an interface device capable of connecting a Teleram 3000 to up to four 5¼-inch disk drives, a parallel printer, serial devices such as modems and plotters, a full-size video monitor and local area network connections. Of course, hard disk drives operating under CP/M also can be added. The Teleram connects to the Office Station through its RS-232C serial port.

The Office Station has the capability to read several common CP/M formats, so finding CP/M software in the proper format is no problem. Also, it can serve as a translation device between the Teleram and other common microcomputers in use (for instance, the Osborne and the CP/M-compatible Apple machines).

In operation, the bubble memory becomes an interim storage device that is uploaded and downloaded at the central station whenever the need arises. In this way, one central station can serve a large number of portable devices.

I should be noted that, since Teleram is a CP/M machine, this central office function actually can be performed by any common CP/M microcomputer with an RS-232C serial port and appropriate communications software, such as Crosstalk.

The Grid has a central system equipped with one disk drive and a hard disk. This central system connects to the Grid through its IEEE-488 bus connector. Unless the Grid gets MS DOS, it will continue to rely on the use of this unique device or its national service to receive programs.

The Grid does have both modem and RS-232C capabilities, so appropriate program and data files can be exchanged with almost all microcomputers equipped with communications software.

The briefcase machines make up an interesting class of portable microcomputers. Certainly, more systems will be moving in this direction in the future. But even now you can put a wide range of capabilities and features in the hands of busy executives and travelers without forcing them to carry large and heavy devices.

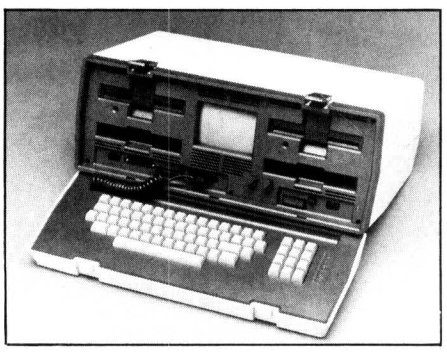
CP/M Boxes with Handles

The second group of portables are Z-80 CP/M machines that have been compactly packaged, given a handle and called portable. This group includes those two head-to-head competitors, the Osborne I and the Kaypro II, and the machine with a slightly different approach, the Otrona.

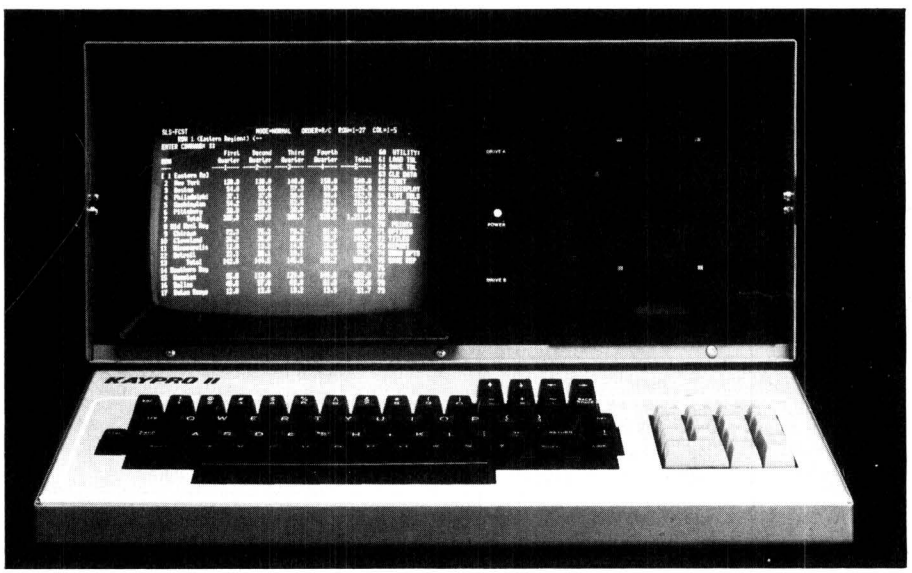
Osborne and Kaypro have taken nearly identical approaches to the market. The differences between them are mainly in the display, disk drives and bundled software.

Both the Osborne I and Kaypro II are Z-80-based machines operating under CP/M with two disk drives, built-in CRT displays and detachable keyboards. Both machines come with serial and parallel ports and a great amount of software, and both carry $1795 price tags.

Physically, the Kaypro II is slightly bigger and heavier than the Osborne. Part of the Kaypro's weight comes from a heavy-gauge metal cabinet.



The Osborne I offers an optional 12-inch monitor. It comes with WordStar, SuperCalc, Microsoft Basic and DBII database management system



The Kaypro II features an 80×24 screen display on a nine-inch monitor. Software includes Perfect Writer, Perfect Speller, Perfect Filer, Perfect Calc and Profit Plan.

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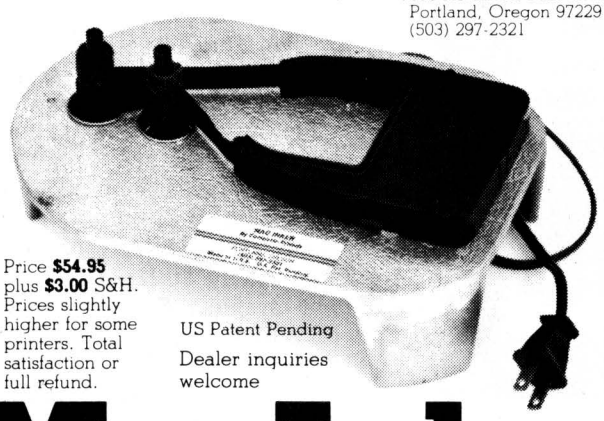

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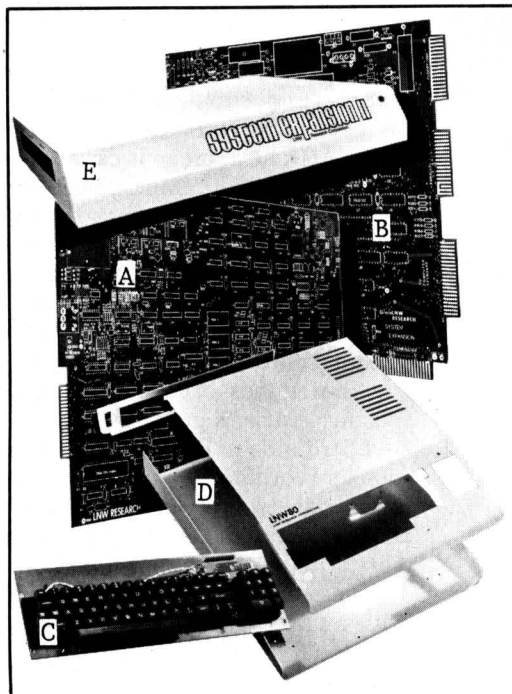

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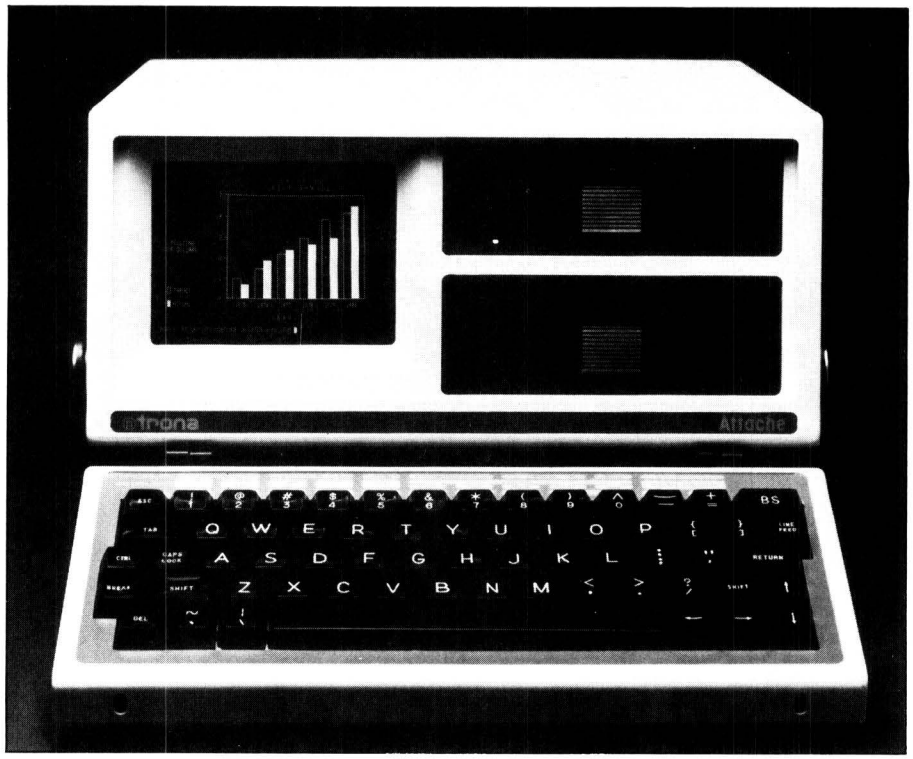


Otrona's Attache portable computer has an IBM Selectric-style keyboard and a guide for the usage of function keys (the guide is located above the number row). The Attache boasts enhanced clarity of screen display.

The attractively designed Hyperion comes with 256K of RAM, 20K of display RAM and 8K of ROM. It's packaged with Microsoft Basic, the Multiplan spreadsheet, a word processor and an electronic mail system.

Osborne supporters like to point out that the Osborne's plastic cabinet can withstand the scuffs and rubs of travel and that the Kaypro's painted metal cabinet will scratch more easily.

Kaypro boosters point at the Osborne's display screen with scorn. The Osborne's five-inch screen displays 52 characters on a line. When longer lines are used, the system automatically jumps the display in one-third screen increments. This technically does not limit the usefulness of the device, since it actually allows the segmented display of wide lines, but the screen jump may bother some operators.

It is usually conceded that the Kaypro's 80-column, green-on-black display on a nine-inch screen is sharp and nice to use for prolonged periods. The Osborne's keyboard is quite plain, while the Kaypro's keyboard features lighted caps and lock keys, excellent touch and audio feedback.

The Kaypro II's $1795 price includes two disk drives with 190K of storage. The Osborne offers double density only as an extra-cost option; its normal disk storage is 80K per disk.

The Osborne I and Kaypro II are packaged to include a large amount of essentially free software (actually, I'm not sure if the software or the hardware is being given away). The Osborne's impressive array of software includes WordStar, SuperCalc, Microsoft Basic and the DBII database management system. Kaypro provides Perfect Writer, Perfect Calc, Perfect Speller and Perfect Filer. The systems also include S-Basic and Profitplan; both machines have data communications capabilities and terminal emulation programs available.

The third member of Z-80-based portable family is the Attache, manufactured by Otrona Corp. The Otrona has taken a smaller, lighter and more expensive course; the machine weighs 18 pounds and uses the half-height, double-density disk drives to cut size while increasing storage capacity. The display uses a 5.5-inch screen that can by user-defined as either 40 or 80 characters; it features bit-mapped graphics not supplied by either the Osborne or Kaypro.

The Attache's screen is easy to read, even though it isn't much bigger than the Osborne's. The keyboard on the Attache has an audio feedback circuit that can be controlled by the user. It has a complete set of ASCII characters, including brackets and braces. The keyboard lacks a lighted caps lock key, but it has excellent touch and spacing. A user's guide on top of the keyboard aids in the use of programs such as WordStar.

The major selling points of the Otrona Attache are its size, CP/M compatibility and disk drive density. The two double-sided, double-density disk drives can provide 720K of storage. Additional factors in the Attache's favor include its ability to display graphics on a 320 × 240 matrix and the inclusion of graphics charting software as a part of the package.

The Attache also comes with Microsoft Basic and a Valet software

package that provides personal appointment information and automatic interface to various applications programs. The system has excellent communications capabilities and is the only one that acts like a specific data terminal (the ADM-3A or VT-52) instead of a dumb teletype machine.

The headwind holding the Otrona back is its price. Buyers must weigh the $3995 price tag against the $1795 charged by the competition and decide if its smaller size and greater disk storage and graphics are worth it.

The PC Portables

The third class of portables are those machines with 16-bit microprocessors that are (or claim to be) compatible with the IBM PC. These can be further divided into those machines that are "clones" and those that are "work-alikes."

The clones can use the expansion cards and other pieces of PC hardware. The work-alikes operate under MS DOS (the same as the IBM's PC DOS) and have the ability to use the same application programs.

Hyperion

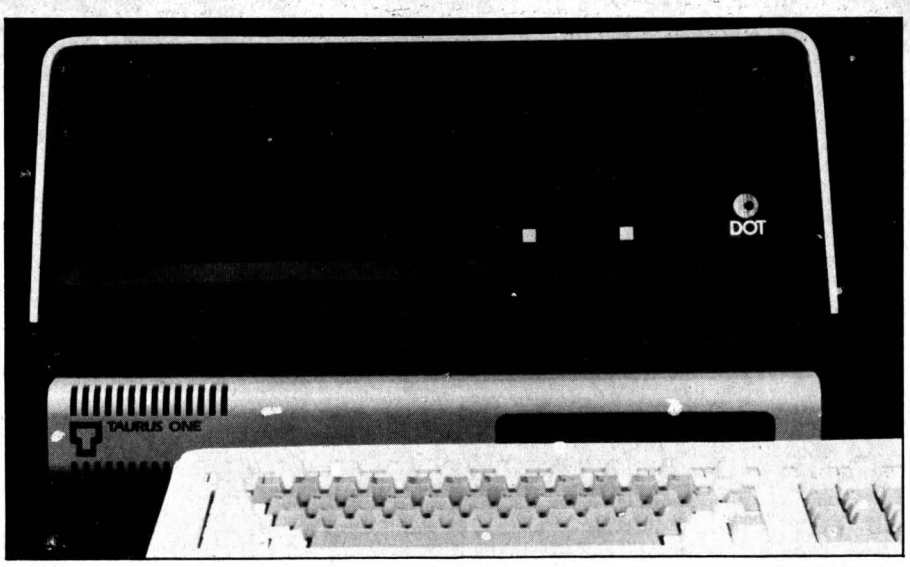
The PC work-alike best known for its style and design is the Hyperion, manufactured by a Canadian firm, Dynalogic. The Hyperion is physically attractive, small, light and powerful. It weighs 20 pounds and measures 18×10×8.5 inches. It is a work-alike because, while it cannot use memory or other expansion cards designed for the IBM PC bus structure, it can read and write disks from the PC disk format and operate under MS DOS.

Certain characteristics of the Hyperion video display may not allow it to be 100 percent PC-compatible, but it can certainly read and write files to and from the PC and use all PC application programs if they are properly installed.

The Hyperion comes with 256K of RAM, 20K of display RAM and 8K of ROM. The low-profile disk drives are dual-sided and each holds the IBM standard 320K of data. An internal clock is provided with battery back-up for constant time and date. The Hyperion has a seven-inch amber phosphor screen capable of displaying 25 lines of 80 characters with excellent clarity. The graphics displays include 640×250 dots, 320×250 dots or IBM PC standard 640×200 and 320×200.

The Hyperion comes with a serial port capable of asynchronous or synchronous communications, a parallel printer port and a built-in modem with auto-answer capability. The keyboard has an excellent feel, audio feedback and a layout that is a significant improvement over the PC's. The cursor control keys are, however, on the keypad.

Dynalogic packages the Hyperion with Microsoft Basic, the Multiplan spreadsheet, a word processor and an electronic mail system. If styling, compactness and nice little extra features mean a lot to you, the Hyperion should score well in your evaluation. It retails for $4995.



The 16-bit Dot from Computer Devices, Inc., executes IBM-PC software and features built-in communications capabilities.

Dot

Computer Devices, Inc., of Burlington, MA, markets a flexible, powerful PC work-alike called the Dot. The Dot places emphasis on data communications, a wide screen display, the use of 3½-inch disk drives and the option of having a full-width printer in a portable machine.

The $3497 version of the Dot includes the 8088 CPU, 64K of RAM, a monitor with bit-mapped graphics, the keyboard, two RS-232C communications ports and one disk drive. An additional $500 will put a fast thermal printer inside the same box.

Options for the Dot include a second Sony 3½-inch drive (287K of data each), a Z-80 CPU card for CP/M and memory expansion up to 704K of RAM. The Dot has two IBM bus-compatible card slots able to accommodate boards up to 10½ inches long.

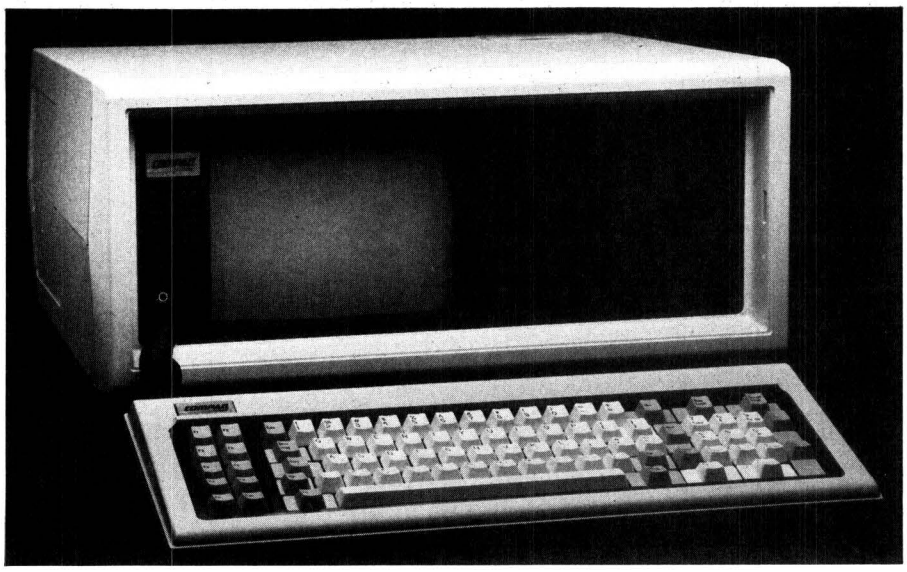
The Dot has a unique five-inch-high by nine-inch-wide monochrome display with bit-mapped graphics. The high-resolution mode provides 1024×248 dots while the IBM mode provides the standard monochrome 640×200. The extra width of the screen gives it the ability to clearly display up to 132 characters on a line. Displays using larger characters at 80 or 40 per line can also be selected. A special 256-character set can provide a double high and double wide font.

The Dot's keyboard is similar to the IBM's, but it has a lighted caps lock key and the programmable keys are spread along the top of the keyboard. The arrow keys are on the keypad; an enter key is also included.

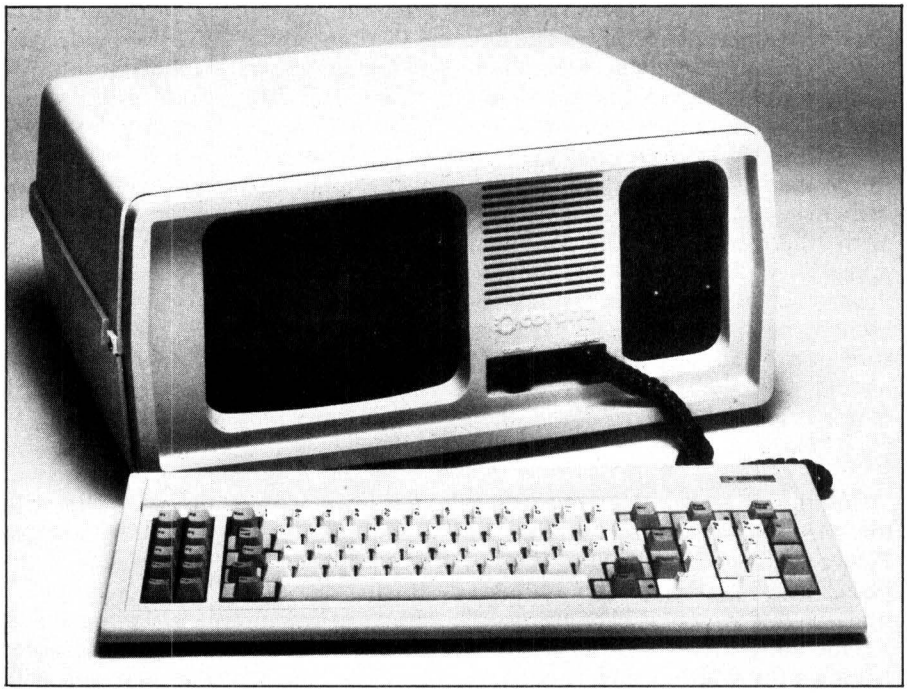
The MS DOS that is used in this system technically makes all of the software developed for the IBM compatible with the Dot, but the use of the small-sized disk format may put a practical limitation on software availability and portability. Computer Devices has signed agreements with various software vendors to make a variety of packages obtainable for the Dot, but you should check the availability of the software you want before you select this machine.

The Dot's optional printer can reproduce anything displayed on the CRT, including graphics and 132-character lines. It has true upper- and lowercase characters with descenders and underscoring. The printer can maintain an average print rate that is fast enough to keep up with data coming directly from a 1200-baud line.

The Dot's large horizontal screen width gives it unique display capabilities. If you're content with the available software and the possible



The Compaq full-function portable computer can run all the popular software packages available for the IBM PC without modification. This 16-bit system features a high-resolution, nine-inch video display and 128K of RAM.



Corona's portable PC has a half-height disk drive, 128K of memory, high-resolution graphics and both a serial and parallel port. It also features MS DOS, a spreadsheet software package and Basic with graphics commands.

limitations on exchanging disks with 5¼-inch systems, the Dot can provide superb value.

Compaq

Compaq Computer Corp. has staked its reputation on its machine being 100 percent compatible with the IBM PC. The basic $2995 Compaq system includes a nine-inch monochrome video display, the 8088 CPU, 128K of RAM (expandable to 256K without using an expansion slot), one 5¼-inch double-sided disk drive, an RGB color video output port and a parallel printer port. A serial port is optional, and the system has room for a second full-height disk drive or two half-height drives.

The Compaq includes three slots for IBM-compatible expansion boards; this is as good as or better than the original PC when you consider that a minimum of two of the PC's five expansion slots are used for a disk controller and video board.

The Compaq measures 20 inches wide by 8.5 inches high by 16 inches deep and it weighs 28 pounds. It's a solid and well-shielded unit that will stand up to the scuffs and bumps of travel.

The Compaq's video display can give you both the high-quality character font available on the IBM monochrome monitor *and* the high-resolution monochrome graphics available from the IBM color graphics adapter. The nine-inch screen, which is sharp and easy to read, displays 25 lines of 80 characters. An outboard RGB color monitor can be added for color graphics displays.

The keyboard is a replica of IBM's, but the audible click is under software control instead of being mechanical, as it is in the IBM. You can make it louder or softer or do without it. Subjectively, the keyboards I tried seemed mushier than the PC's; Compaq did nothing to improve on IBM's keyboard layout.

I sat through a series of tests that proved to me that the Compaq will accept software and hardware exactly like the PC. If software portability is a concern, then the Compaq should be high on your list. The user of this machine can choose from the entire IBM PC software and expansion hardware markets.

At $2995, the Compaq is priced about $600 dollars below the price of a comparably-equipped IBM PC. And while it isn't briefcase-sized, it certainly is portable.

Corona and Colby

The last two machines I will describe, the Corona and the Colby, are the only ones that I have not personally worked with, so I can't provide much in the way of subjective assessment. Both machines, however, advertise full PC compatibility. The Corona portable is one-half of a set of twins providing PC power at low cost. The Colby is a true PC clone.

Corona Twins

Corona Data Systems is marketing a portable and a desktop system, and hard disk options are available for both. According to Corona, these systems share complete software and hardware compatibility with the IBM PC, but they offer more expansion capability. The retail price of the Corona PC is $2595; the Corona portable PC retails for $2395.

The basic Corona portable system includes one half-height disk drive, a

green screen monitor, 128K of memory, both a serial and a parallel port, high-resolution graphics, MS DOS, Basic with graphics commands and a spreadsheet software package. If you add a second disk drive to the portable system, the package price goes up to $2795. An external ten-megabyte hard disk is available for the portable at an additional $2695.

The Corona portable PC provides all of the above features and still has room for three full-size expansion cards and one half-size card such as the IBM serial port card. It weighs 30 pounds and is eight inches high, 20 inches wide and 20 inches deep.

The Corona keyboard is slightly improved over IBM's in that the caps lock and number lock keys have lights to indicate their status. The keyboard connection is on the front of the computer, so the keyboard can be moved out to the full six-foot length of the cable.

Corona's graphics system offers 640 × 325 dot resolution, as compared to the 640 × 200 capability of the IBM color graphics board. The graphics images of the Corona are stored in the main system memory rather than on the interface card, so several images can be stored at the same time. This allows rapid swapping of graphics images without the delay IBM PC users are accustomed to.

I personally can't guarantee that the Corona will be 100 percent compatible with all PC graphics, but you can insert a standard IBM color graphics card in one of the Corona's slots and get the standard color capability.

The Corona portable PC should be available by the time this article reaches print. It represents a good value in a portable and it has an interesting trade of price and features with the Compaq, Dot and other PC systems.

Colby Kit

The Colby Computer is an IBM PC clone in the fullest sense. You take pieces from the old one to make a new one. For $899, Colby Computer can provide you with a cabinet, chassis and power supply that you can convert into a true PC portable.

You have to complete the conversion by moving the motherboard, disk drive and keyboard from your standard PC into the Colby cabinet. The result is a 26-pound portable unit with its own nine-inch display and full PC power.

The features of the Colby are the features of your PC. You (or a Colby dealer) literally move everything except the power supply to the new chassis. You can use all of your expansion and multifunction cards. The Colby video display is separate from the normal PC video system, so you can use both the internal monitor and the standard displays simultaneously.

> Can a device that can be easily carried and even slipped into a briefcase have full-size machine power?

The Colby chassis will accept only one full-height 5¼-inch disk drive. You could install two half-height drives in the same space. For another $135, Colby will sell you a new board for your old (nearly empty) PC chassis, allowing it to be used as an expansion chassis with more card slots and disk drives.

The Colby Computer can provide an alternative for all of the PC owners who wish their IBM PCs had more portability.

The Future

The machines in this review prove that you can have full-size machine power in a device that can be easily carried and even slipped into a briefcase. This trend will certainly continue.

Commodore has announced a 12-pound portable machine with a color display able to use both CP/M and Commodore-64 software. If rumors can be believed, Tandy and IBM are both planning portable systems, and companies like Osborne are getting ready to release second-generation systems.

The manufacturers of desktop systems are going to have to provide many extended features if they are going to prove to buyers that they have the advantage over portables. ■

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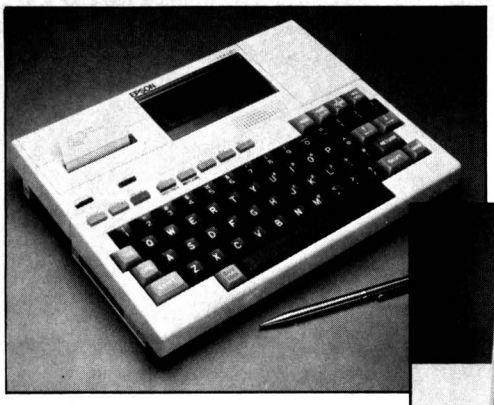
The 33-pound Access has an 80-column by 24-line screen. →

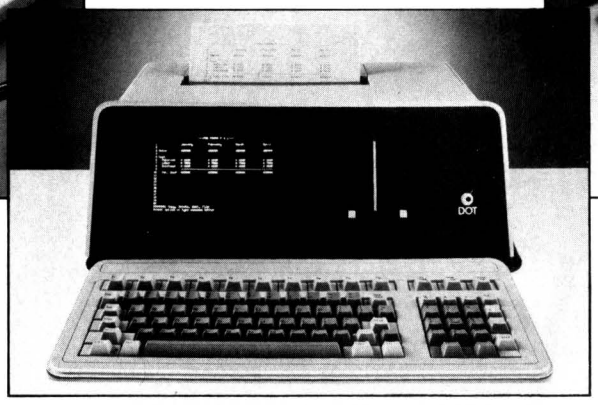
Buyer's Guide To Portables

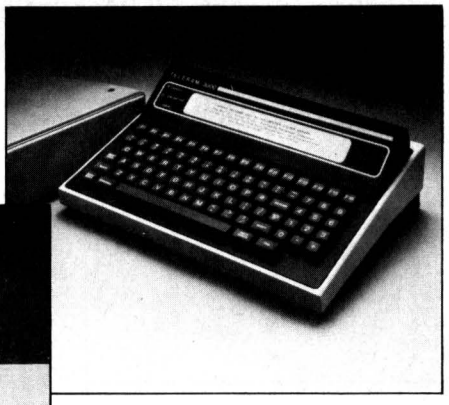
Model	Manufacturer	Dimensions	Weight	Price	Microprocessor	Bit Configuration
HX-20	Epson 3415 Kashiwa St. Torrance, CA 90505	1.75″ × 11.375″ × 8.5″	4 lbs.	$795	6301	8-bit
Compass Computer	Grid Systems Corp. 2535 Garcia Drive Mountain View, CA 94043	15″ × 11½″ × 2″	10 lbs.	$8150	8086 & 8087	16-bit
Teleram 3000	Teleram Communications Corp. 2 Corporate Park Drive White Plains, NY 10604	3.45″ × 13″ × 9.75″	8.75 lbs.	$2995	Z-80L	8-bit
Osborne 1	Osborne Computer Corp. 26538 Danti Court Hayward, CA 94545	8.5″ × 20.5″ × 14.5″	26.2 lbs.	$1795	Z-80A	8-bit
Kaypro II	Non-Linear Systems 533 Stevens Ave. Solana Beach, CA 92075	14″ × 17″ × 8″	26 lbs.	$1795	Z-80-based	8-bit
Attache	Otrona Advanced Systems Corp. 4755 Walnut St. Boulder, CO 80301	5.75″ × 12″ × 13.6″	18 lbs.	$3995	Z-80A	8-bit
Hyperion	Dynalogic Info-Tech Corp. 8 Colonnade Road Ottawa, Ontario K2E 7M6	8.8″ × 18.3″ × 10″	21.25 lbs.	$4995	8088	16-bit
Dot	Computer Devices, Inc. 25 North Avenue Burlington, MA 01803	8.5″ × 18″	29 lbs.	$2995	8088	16-bit
Compaq	Compaq Computer Corp. 12330 Perry Road Houston, TX 77070	20″ × 8.5″ × 16″	28 lbs.	$2995	8088	16-bit
Corona portable	Corona 31324 Via Colinas Westlake Village, CA 91361	8″ × 20″ × 20″	28 lbs.	$2395	8088	16-bit
Access	Access Matrix Corp. 2159 Bering Drive San Jose, CA 95131	16.5″ × 10″ × 10.8″	33 lbs.	$2495	Z-80A	8-bit
Basis 108	Basis Microcomputer 5435 Scotts Valley Drive Scotts Valley, CA 95066	Keyboard—1.9″ × 19.2″ CPU—7.5″ × 19.3″	Keyboard—5.4 lbs. CPU—28 lbs.	$2150	6502 & Z-80	8-bit
Electric Briefcase	Compal 8500 Wilshire Boulevard Beverly Hills, CA 90211	9″ × 20″ × 15″	26 lbs.	$1995	Z-80A	8-bit
DMS-3/F "Fox"	Digital Microsystems 1755 Embarcadero Oakland, CA 94606	17.5″ × 14.7″ × 7.8″	30 lbs.	$3995	Z-80A	8-bit
HP-75C	Hewlett-Packard 3000 Hanover Road Palo Alto, CA 94304	10″ × 5″ × 1.25″	26 oz.	$995	CMOS HP Series 80	8-bit



↑ *Epson's HX-20 costs less than $800.*

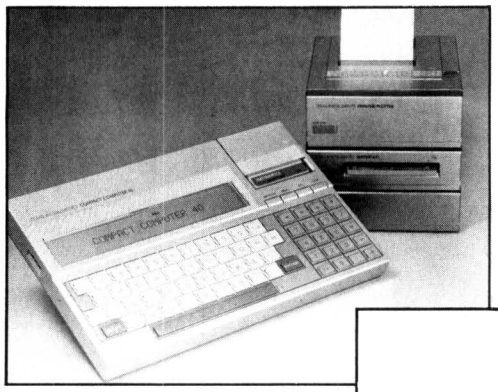
The Teleram 3000 measures 3.45× 13×9.75 inches.→





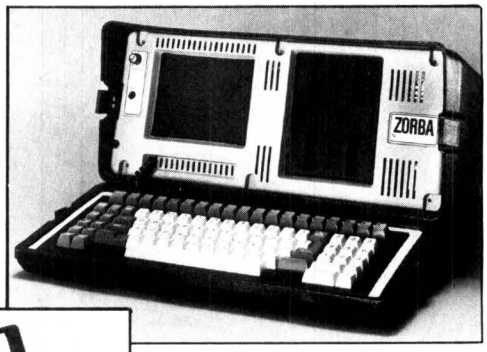
←The Dot, from Computer Devices, Inc., features a built-in, nine-inch monitor.

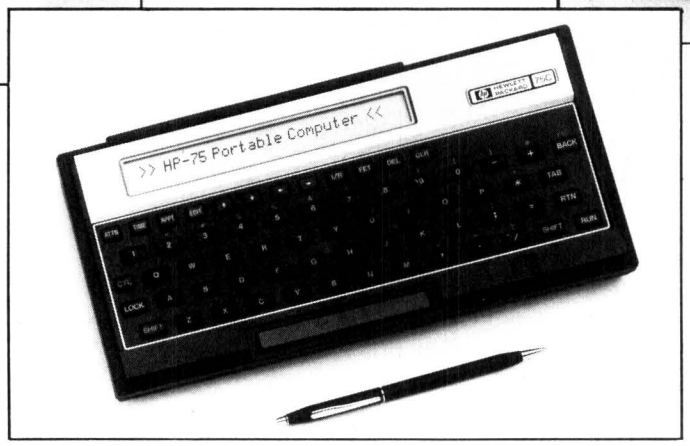
Memory Capacity	Drive Capacity	Size	Operating System	Hard Disk	Monitor	Color	Interface
16K RAM (min.) 32K RAM (max.) 32K ROM	320K	5¼″	Microsoft Basic	not available	Built-in LCD display, 20 characters×4 lines	N	RS-232
256K RAM	384K nonvolatile bubble memory	—	Compass Computer Operating System	5M 5¼″ hard disk	Flat-panel electroluminescent display, 6″, 53 col.×24 lines	N	RS-232
64K RAM 4K ROM	128–256K nonvolatile bubble memory	—	CP/M 2.2	available	Built-in LCD display, 80 cols.× 4 lines	N	RS-232 Parallel—optional
64K RAM 4K ROM	204K	5¼″	CP/M	not available	Built-in 5″ monitor 52 cols.×24 lines	N	RS-232 Parallel
64K RAM 4K ROM	195K	5¼″	CP/M	not available	Built-in 9″ monitor 80 cols.×24 lines	N	RS-232 Parallel
64K RAM	360K	5¼″	CP/M	not available	Built-in 5″ monitor 80 cols.×24 lines	N	RS-232 Parallel
256K RAM (min.) 1M RAM (max.) 8K ROM	320K	5¼″	MS DOS	10–20 M, 5¼ hard disk	Included, 80 cols. ×25 lines 7″ monitor	N	RS-232 Parallel
32K RAM (min.) 704K RAM (max.) 64K ROM	280K	3½″	MS DOS	not available	Built-in 9″ monitor, 40, 80 or 132 cols. ×16 or 25 lines	N	RS-232
128K RAM (min.) 256K RAM (max.)	32K	5¼″	MS DOS	5¼″ hard disk	9″ 80 col.×25 lines monitor	Y	Parallel
128K RAM (min.) 512K RAM (max.)	320K	5¼″	MS DOS	10M hard disk	9″ built-in monitor	N	RS-232 Parallel
64K RAM Two 4K EPROMs	184K	5¼″	CP/M 2.2	not available	Built-in 7″ 80 cols.×24 lines	N	RS-232 Parallel
64K RAM (min.) 128K RAM (max.) 10K ROM	130K	5¼″	—	not available	12″ monitor 80 cols.×24 lines	Y	RS-232 Parallel
64K RAM 4K ROM	200K	5¼″	CP/M	10M 5¼″ hard disk	Built-in 9″ 80 cols.×24 lines	N	RS-232 Parallel
64K RAM 2K ROM	614.4K	5¼″	CP/M 2.2	not available	Built-in 9″ 80 cols.×25 lines	N	RS-232 Parallel
16K RAM (min.) 24K RAM (max.) 48K ROM	not applicable	not applicable	—	not available	32-character LCD display	N	RS-232 Parallel—optional



↑ *Texas Instruments' CC-40 weighs all of 22 ounces.*

The Zorba, from Telcon Industries, has a built-in, seven-inch monitor.→





The HP-75C, from Hewlett-Packard, retails for $995.→

Model	Manufacturer	Dimensions	Weight	Price	Microprocessor	Bit Configuration
Escort	Jonos, Ltd. 920-C E. Orangethorpe Anaheim, CA 92801	7.25" × 17.25" × 13.25"	25 lbs.	$2495	Z-80A	8-bit
M6000P	Micro Source, Inc. 595 N. Clayton Road New Lebanon, OH 45345	17" × 20" × 7"	32 lbs.	$3900	Z-80A	8-bit 16-bit optional
OL-H004	Olympia Route 22 N. and Orr Drive Somerville, NJ 08876	9" × 3.75" × 1.25"	21 oz.	$380	6502	8-bit
Quasar HHC	Quasar 9401 W. Grand Ave. Franklin Park, IL 60131	3.75" × 8.9" × 1.25"	14 oz.	$329	6502	8-bit
Husky	Sarasota Automation 1500 N. Washington Blvd. Sarasota, FL 33577	9.5" × 8" × 1.75"	4.5 lbs.	$2995	Z-80	8-bit
Pied Piper I	STM Corporation 525 Middle Field Road Menlo Park, CA 94025	4" × 20.2" × 10.8"	4.5 lbs.	$1299	Z-80A	8-bit
Zorba	Telcon Industries 1401 NW 69th St. Ft. Lauderdale, FL 33309	9" × 17.5" × 16"	22 lbs.	$1995	Z-80A	8-bit
CC-40	Texas Instruments, Inc. PO Box 10508 Lubbock, TX 79408	9.5" × 5.75" × 1"	22 oz.	$249.95	TMS 9995	16-bit
PC-1500	Sharp Electronics Corp. 10 Sharp Plaza Paramus, NJ 07652	7.7" × 1" × 3.4"	.8 lbs.	$300	CMOS	8-bit
New Brain AD	Grundy Business Systems Ltd. Somerset Road, Teddington, Middlesex TW11 8TD	11" × 6.2" × 2"	3.3 lbs.	$470	Z-80A	8-bit
Zita	ITSC 2 Kingston Road Staines, Middlesex TW18 4PA	20.4" × 17.4" × 8.2"	29 lbs.	$1800	Z-80A	8-bit
M-23 P	Socius Computer Systems 6 St. Albans St. Haymarket, London SW1Y 4SQ	17.5" × 15.7" × 5.2"	17 lbs.	$3700	Z-80A	8-bit
Scorpion	MicroAPL 19 Catherine Place Victoria, London SW1E 6DX	20.4" × 16.3" × 8.2"	29 lbs.	$10,700	68000	16-bit

↑ *The Quasar HHC weighs just 14 ounces.*

←*The Pied Piper I features 256K drive capacity.*

Also scheduled for release are:

—Athena I (Athena Computer and Electronic Systems, 31952 Camino Capistrano, San Juan Capistrano, CA 92675) is a battery-operated portable computer weighing 15 lbs. and measuring 3-3/8" × 11-7/8" × 14-1/2". It features 68K RAM and 6K ROM and runs under the CP/M operating system. Price is $3950.

—Commodore Business Machines (687 Devon Park Drive, Wayne, PA 19087) plans to release a 64K portable color computer for $995. This C-64-compatible machine will feature a 6502 CPU, 36K RAM (expandable to 64K), 20K ROM and a five-inch color monitor. It will come with word processing and electronic spreadsheet software, a detachable keyboard and a printer option.

—The Colby Computer (Colby, No. Two, Palo Alto Square, Palo Alto, CA 94304) offers complete IBM compatibility with transfer of motherboard, disk drive and keyboard from the PC to the Colby chassis. The 26-1b, shell features a nine-inch monitor. Price is $899.

Memory Capacity	Drive Capacity	Size	Operating System	Hard Disk	Monitor	Color	Interface
64K RAM 8K ROM	322K	2½"	CP/M	5M 3.9" hard disk	Built-in 9" monitor 80 cols. × 25 lines	N	RS-232 Parallel—optional
64K RAM (min.) 1M RAM (max.) 8K ROM	386K 1.2M	5¼" 8"	CP/M	4-40M 5¼" hard disk	Built-in 9" 80 cols. × 24 lines	Y	RS-232 Parallel
4K RAM (min.) 52K RAM (max.) 64K ROM	not applicable	not applicable	not applicable	not available	not included	Y	RS-232—optional
2K RAM 16K ROM	not applicable	not applicable	not applicable	not available	32-character LCD display	Y	RS-232—optional
16K RAM (min.) 144K with factory upgrade 28K ROM	not applicable	not applicable	CP/M	not available	4 lines × 32 characters LCD display	N	RS-232 Parallel—optional
64K RAM (min.) 256K RAM (max.) 4K ROM	256K	5¼"	CP/M	5 or 10 M hard disk	2-line LCD display optional	N	Parallel RS-232—optional
64K RAM 16K ROM	380K	5¼"	CP/M	not available	Built-in 7" monitor 80 cols. × 25 lines	N	RS-232 Parallel—optional
6K RAM (min.) 16K RAM (max.) 34K ROM	not applicable	not applicable	TI Basic	not available	31-character LCD display	N	RS-232
3.5K RAM (min.) 7.5K RAM (max.) 16K ROM	not applicable	not applicable	PC-1500 OS	not available	26-character LCD display	N	Parallel RS-232—option
32K RAM (min.) 2M RAM (max.) 29K ROM	not applicable	not applicable	New Brain OS	optional	not included	N	RS-232 serial
64K RAM (min.) 512K RAM (max.) 5K ROM	125K	5¼"	CP/M	5 to 12 M	10" monitor 80 cols. × 25 lines	N	RS-232 Parallel—optio
128K RAM 4K ROM	580K	3½"	Sord OS	not available	80 char. × 8 lines LCD display	Y	RS-232 Parallel
256K RAM (min.) 1M RAM (max.)	720K or 1.2M	5¼"	Mirage OS	10M hard disk	9" monitor 80 cols. × 24 lines	N	RS-232—optional Parallel—optional

Supercharge Your VIC

If you find the 5K memory capacity of the VIC too restrictive, you—and your computer—will get a big boost from this do-it-yourself memory expansion article.

By Dan Rubis

To start off let me say that even readers who are not interested in hardware will find something in this article for them. So please read on.

The Commodore VIC-20 comes with 5K of programmable random access memory (RAM). It uses some of the RAM for screen refresh and operating system use; this leaves only 3583 bytes for programs, so it is not long before you run out of memory. Of this memory, 1K is addressed from 0000 to 03FF hexadecimal and the remaining 4K is addressed from 1000 to 1FFF hexadecimal. This leaves a 3K gap from 0400 to 0FFF.

Although there is no internal memory assigned to this address space, Commodore has decoded these addresses in 1K units and has brought the chip-select signals out to the 44-pin-memory-expansion port at the rear of the VIC-20 (see Fig. 1). These memory select lines are labeled $\overline{\text{RAM1}}$, $\overline{\text{RAM2}}$ and $\overline{\text{RAM3}}$ on pins 14, 15 and 16 of the memory expansion port. By using these select lines, it is easy to upgrade your VIC-20 to 8K of programmable memory, because no additional address decoding is necessary.

RAM Expansion

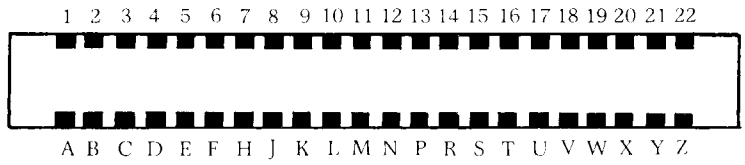
Commodore uses the 2114 low power static memory for the computer's internal 5K of memory. By using the select lines $\overline{\text{RAM1}}$, $\overline{\text{RAM2}}$, $\overline{\text{RAM3}}$ and another 3K of your own 2114s, you can upgrade your VIC-20 microcomputer with a minimum of effort and expense.

The 2114 integrated circuit (IC) is configured as 1024 words by four-bit memory. It is housed in an 18-pin dual in-line package with ten address lines (A0–A9), four data lines (D0–D3), a read/write line (R/W) and a chip select line ($\overline{\text{CS}}$). See Fig. 2 for the pin designations. Since the 2114 memory is only four bits wide, a byte of memory will require two of these ICs to be selected at the same time to form an eight-bit-wide byte.

For the schematic diagram of the 3K RAM expansion circuit see Fig. 3. For each 1K pair of 2114s, one RAM select line is connected to the CS line pin 8 of the ICs. Pin 17 of the expansion port is the read/write line (VR/W) and is connected to the R/W line pin 10 of the 2114. Address pins CA0 to CA9 and data pins CD0 to CD7 of the expansion port are connected to the A0 to A9 and D0 to D3 lines on the 2114, respectively.

Commodore has also made provisions for adding external ROM to the VIC-20. Referring to Fig. 1, you will notice pins labeled $\overline{\text{BLK1}}$, $\overline{\text{BLK2}}$, $\overline{\text{BLK3}}$ and $\overline{\text{BLK5}}$. They are select pins for memory which is decoded in 8K units.

$\overline{\text{RAM1}}$, $\overline{\text{RAM2}}$, $\overline{\text{RAM3}}$ and the internal 5K of memory in the VIC-20 are in BLK0. Blocks $\overline{\text{BLK1}}$, $\overline{\text{BLK2}}$ and $\overline{\text{BLK3}}$ are available for RAM or ROM expansion. Blocks $\overline{\text{BLK4}}$, $\overline{\text{BLK6}}$ and $\overline{\text{BLK7}}$, which are not brought out to the expansion port, are reserved for charac-



PIN #	TYPE	PIN #	TYPE	PIN #	TYPE	PIN #	TYPE
1	GND	12	$\overline{\text{BLK3}}$	A	GND	N	CA10
2	CD0	13	$\overline{\text{BLK5}}$	B	CA0	P	CA11
3	CD1	14	$\overline{\text{RAM1}}$	C	CA1	R	CA12
4	CD2	15	$\overline{\text{RAM2}}$	D	CA2	S	CA13
5	CD3	16	$\overline{\text{RAM3}}$	E	CA3	T	I/02
6	CD4	17	VR/W	F	CA4	U	I/03
7	CD5	18	CR/W	H	CA5	V	S02
8	CD6	19	$\overline{\text{IRQ}}$	J	CA6	W	$\overline{\text{NMI}}$
9	CD7	20	NC	K	CA7	X	$\overline{\text{RESET}}$
10	$\overline{\text{BLK1}}$	21	+5V	L	CA8	Y	NC
11	$\overline{\text{BLK2}}$	22	GND	M	CA9	Z	GND

Fig. 1. The Commodore VIC-20's memory expansion port located at the rear in a slotted opening at the power-switch end of the computer.

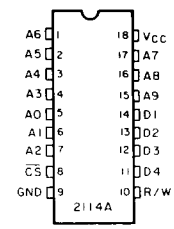


Fig. 2. Pin designations.

SOFTWARE DESCRIPTIONS

TPM (TPM I) - $80 A Z80 only operating system which is capable of running CP/M programs. Includes many features not found in CP/M such as independent disk directory partitioning for up to 255 user partitions, space, time and version commands, date and time, create FCB, chain program, direct disk I/O, abbreviated commands and more! Available for North Star (either single or double density), TRS—80 Model I (offset 4200H) or II, Versafloppy I, or Tarbell I.

TPM-II - $125 An expanded version of TPM which is fully CP/M 2.2 compatible but still retains the extra features our customers have come to depend on. This version is super FAST. Extended density capability allows over 600K per side on an 8" disk. Available preconfigured for Versafloppy II (8" or 5"), Epson QX-10, Osborne II or TRS-80 Model II.

CONFIGURATOR I

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	TRS80II	TRS-80 Model II
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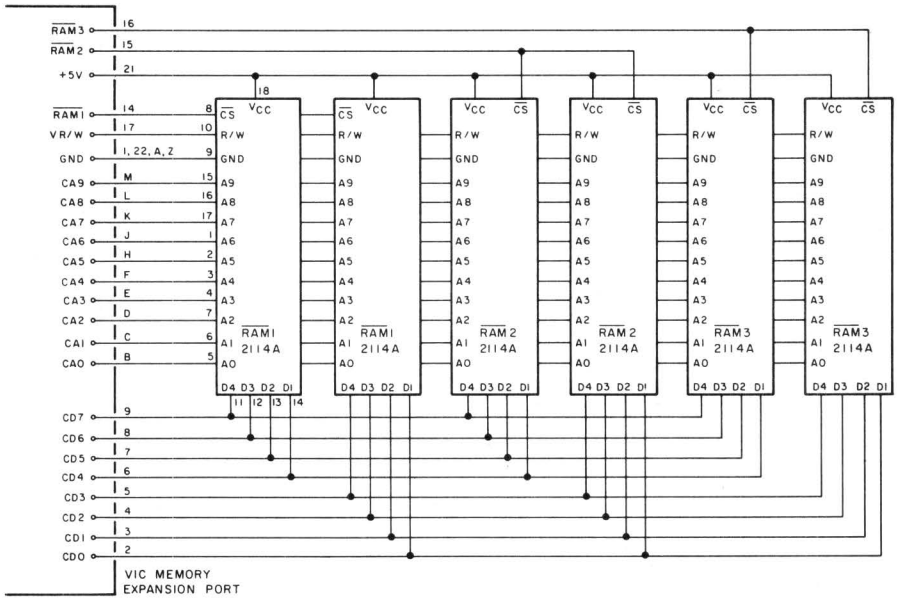

Fig. 3. VIC-20 3K memory expansion circuit diagram.

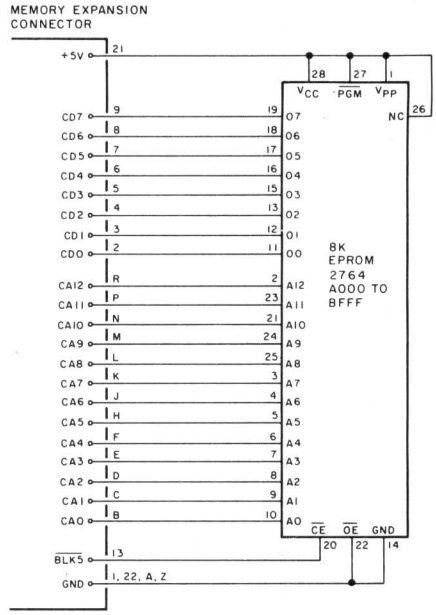

Fig. 4. A schematic diagram circuit for adding 8K of EPROM memory to the VIC-20. This design can also accommodate a single 2732 when inserted into the bottom 24 pins of the 2764 socket.

ter generation, input/output ports, video interface chip and color RAM.

The $\overline{BLK5}$ pin is used for ROM expansion. This 8K block is addressed from A000 to BFFF hexadecimal. Commodore uses this area for their game cartridges like Jupiter Lander, VIC Avenger, etc.

When turned on, the computer will autostart by trying to execute any machine-language program that is addressed at A000 hexadecimal. If it does not find a program to execute, it will perform its normal initialization procedures. Upon completing initialization, it will execute the Basic interpreter program and give you the familiar "READY." prompt.

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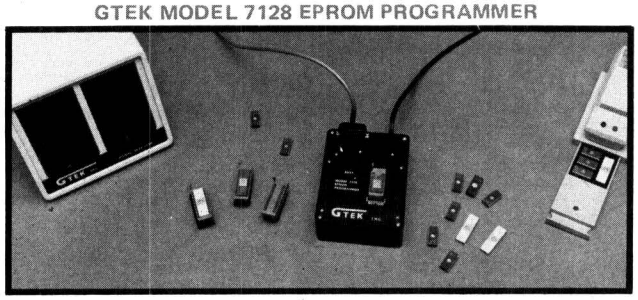

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2732	2532	C6716	48016	8741
2732A	2564	27C64		8742
2764	68766			8751
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tage. If his program is saved on an EPROM that is addressed at A000 hexadecimal, it will execute immediately when you power up the computer.

ROM Expansion

Direct your attention to Fig. 4—the schematic diagram for adding a 2764 8K EPROM to the VIC-20. Since the 2732 4K EPROMs are more readily available, Fig. 5 shows how to decode $\overline{\text{BLK5}}$ into two 4K segments of address space.

Notice that the CD-4011 NAND gate IC is added to help select one of the two 2732 EPROMs. Bit CA12 of the address must be sampled along with the $\overline{\text{BLK5}}$ select pin. When the $\overline{\text{BLK5}}$ pin and CA12 are at logic-zero, the NAND gate's c-output will go to logic-zero, and therefore activate the first 2732 EPROM. When $\overline{\text{BLK5}}$ is logic-zero and CA12 is logic-one, the NAND gate's d-output will go to logic-zero, and the second 2732 will be active. Finally, when the $\overline{\text{BLK5}}$ pin is logic-one, neither of the two EPROMs is activated. See Fig. 6 for the truth table for the NAND gate, and the pin designations for the Intel 2764, 2732

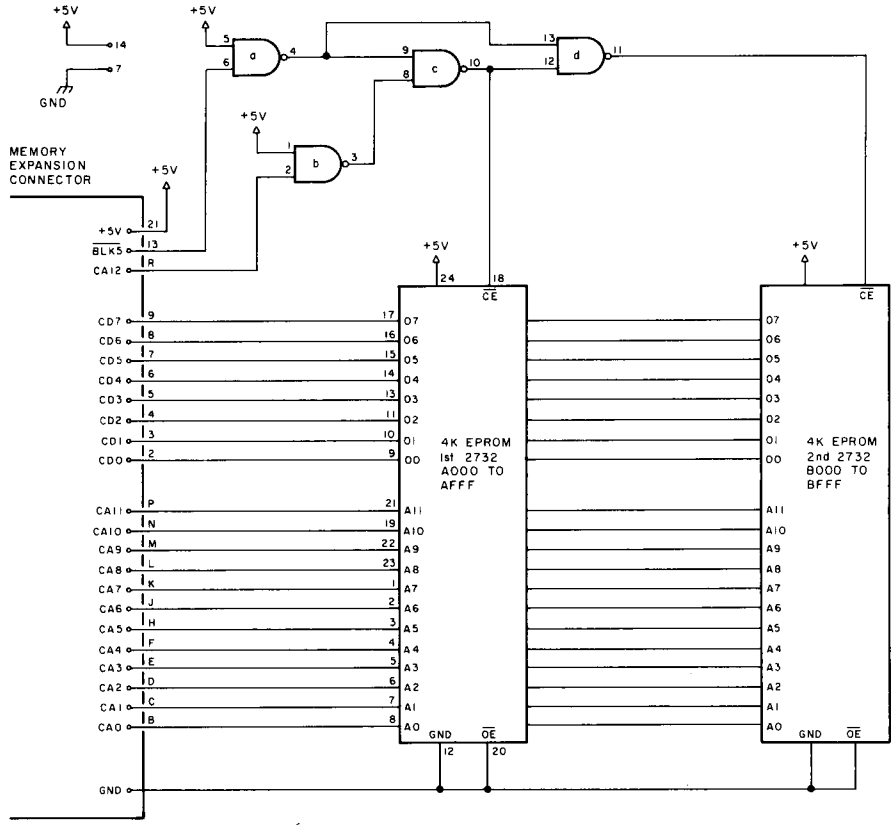

Fig. 5. The NAND gates from a CD-4011 are used to decode the 8K of address space in block 5 for two 4K 2732 EPROMs.

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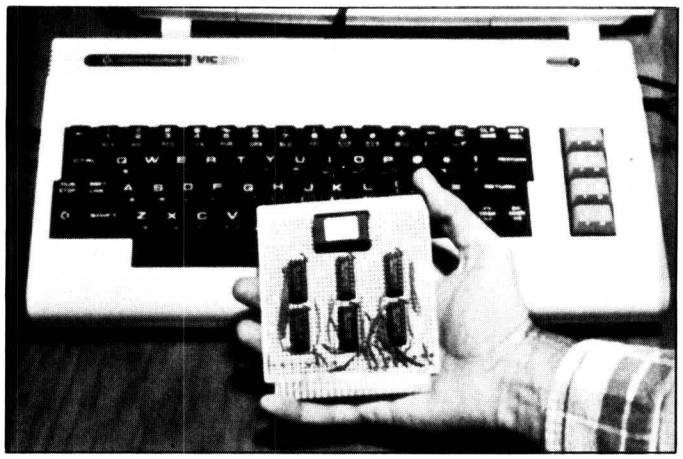

Photo 1. The author's proto-type circuit for expanding the VIC-20's memory uses six 2114 low power RAMs and one 2732 EPROM.

Photo 2. Memory expansion board in the rear port of the VIC-20. Notice that it protrudes from the rear of the computer. Care must be taken when using the board.

and CD-4011 ICs.

Now compare the pin designations for the 28-pin 2764 and the 24-pin 2732 ICs—Figs. 6b and 6c. The bottom 24 pins of the 2764 are identical to the 2732. Therefore, if you need only 4K of EPROM memory for your program, all you have to do is plug the 2732 into the lower 24 pins of the 2764 socket. This convenient feature will allow you to upgrade to a 2764 at a later time.

Construction

Construction is easily accomplished using a 44-pin standard prototyping board like the ones sold by Radio Shack and Vector. I was able to assemble the 3K of 2114 RAM and one 2732 EPROM on a 4 × 4.5 board with no problem. See Fig. 7 and Photo 1 for a typical board layout. Photo 2 shows the circuit installed into the memory expansion port of the VIC-20. When the board is installed, the computer reports that there are 6655 bytes free instead of 3583.

Use sockets for the 3K of RAM and point-to-point jumper wires on both sides of the board for the interconnection. The EPROM socket will have to be wire wrapped because of the limited amount of remaining space on the proto-board.

Some mail-order discounters are selling 2114 memory for less than $1.90 each. The total cost of the project will be less than $25, including the RAM memory, proto-board and sockets.

Programming EPROM

Programming EPROMs can be accomplished several ways. Your choice will depend on how much you're willing to spend. For several thousand dollars you can buy an industrial-grade programmer. Also, several suppliers offer programmer's circuits that will interface to most of the popular computers. Some electronic supply companies offer custom programming for a fee. But as an inexpensive alternative, you can build your own.

I am currently working on a programmer design that uses the VIC-20 computer, and should have the details worked out soon.

Conclusion

If you still feel that constructing your own memory-expansion board is beyond your present capabilities, at least now you have the necessary information to make a knowledgeable decision when purchasing an expansion board from a supplier.

If the board costs more than $25 for 3K of RAM, insist that it be a quality, double-sided printed circuit board with gold-plated connector fingers, and that it be enclosed in a professional-looking case similar to the game cartridges supplied by Commodore. ■

Address correspondence to Dan Rubis, PO Box 402, St. Clair Shores, MI 48080.

NAND

A	B	X
0	0	1
0	1	1
1	0	1
1	1	0

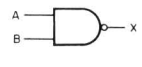

Fig. 6a. NAND gate truth table.

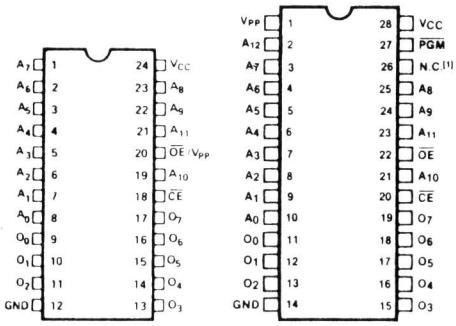

Fig. 6b. The Intel 4K and 8K EPROMs. Notice that the lower 24 pins of the 2764 are the same as the 2732, except for pin 26, which can be wired to pin 28.

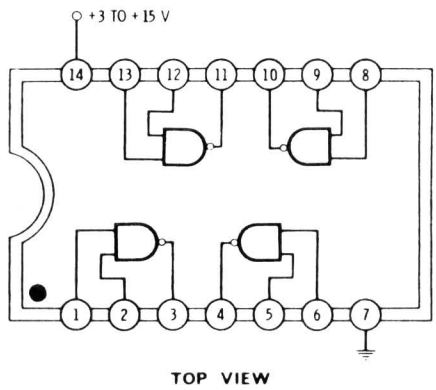

Fig. 6c. Complementary metal oxide semiconductor (CMOS) NAND gate CD-4011.

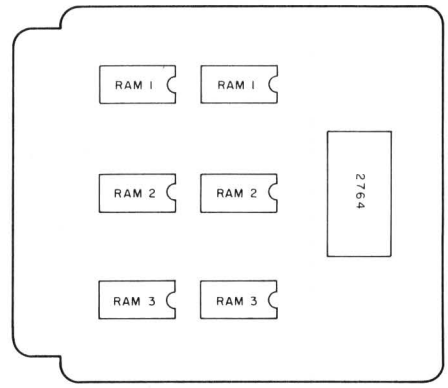

Fig. 7. Typical board layout for 3K RAM plus 8K of EPROM expansion for the VIC-20. A Radio Shack No. 276-154 4 × 4.5 prototyping board was used.

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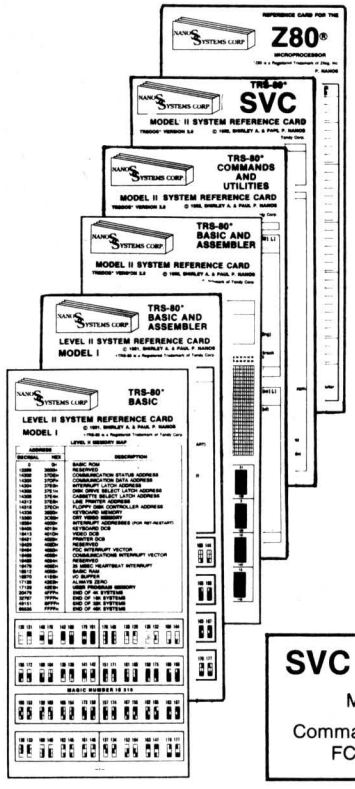

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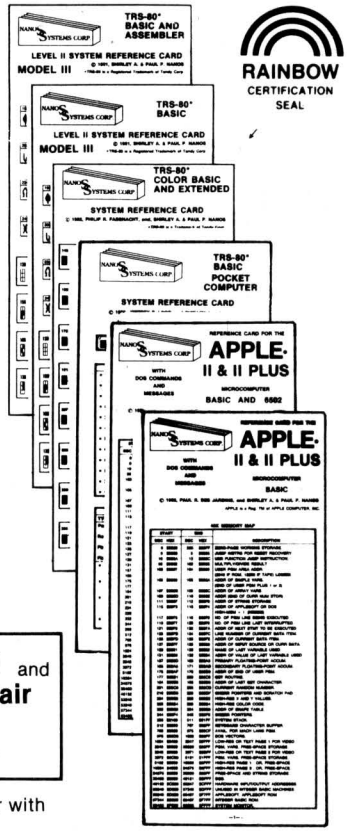

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A T-S 1000 Keyboard You Can Get Your Hands On

The Timex-Sinclair 1000's keyboard can be a nightmare to programmers and users. This article describes how to construct your own full-size, inexpensive keyboard.

By Jim Stephens

When it comes to designing computer keyboards, smaller is not necessarily better. The designers of the Timex-Sinclair 1000 only had the computer user in mind when they reduced this important programming tool to a fraction of the required size. For the programmer, the little plastic membrane can be a nightmare. By adding a full-size keyboard to this amazing little micro, I cut my programming time in half, had far fewer errors and practiced my typing at the same time.

Surplus Keyboards

If money is no object, several companies make excellent full-size and full-price keyboards for immediate connection to the TS-1000. However, for those of us who have some small strips of ribbon cable and a good soldering iron, real bargains can be had.

Many mail-order surplus houses now offer used keyboards in all varieties of configurations and conditions. They apologize that the keyboards have no electronics, but that's just what we need! Also, we don't mind the low prices. Several companies list excellent data-entry keyboards for less than $20.

When your keyboard arrives, you will find that several of the keys in each row are tied together by common connections on the printed circuit board. This can be to your advantage, but can only be checked by using Fig. 1 and an ohmmeter. Most of the time, it's better just to cut all of the common connections and rewire the entire board to suit yourself. If you have with a double-sided printed circuit board, simply remove alternate rows of keys and cut every copper foil you see on the top of the board. This will usually untie most common connections.

Test each key with an ohmmeter to make sure that the key is operating properly. If one of the keys has a problem, just unsolder and switch it with one of the many extra keys on the board. If you're lucky, your surplus board will come with its own numeric pad.

Once you have disconnected each key from its neighbors, you're ready to rewire. First, clearly mark the function of each key on the bottom of the board. I know this sounds silly, but your typing speed will decrease on a board that is wired backward. Second, choose one of the key connection pins to correspond with the vertical matrix lines (Fig. 1). The other pin will be for the horizontal connections. On the ones that I've rewired, I assigned the vertical lines to the top key pin.

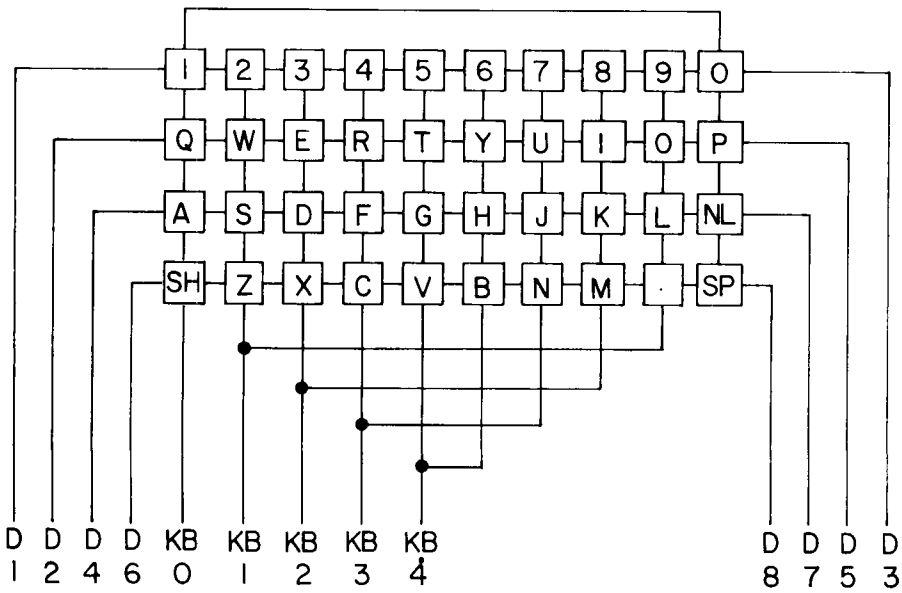

Fig. 1. Keyboard matrix lines.

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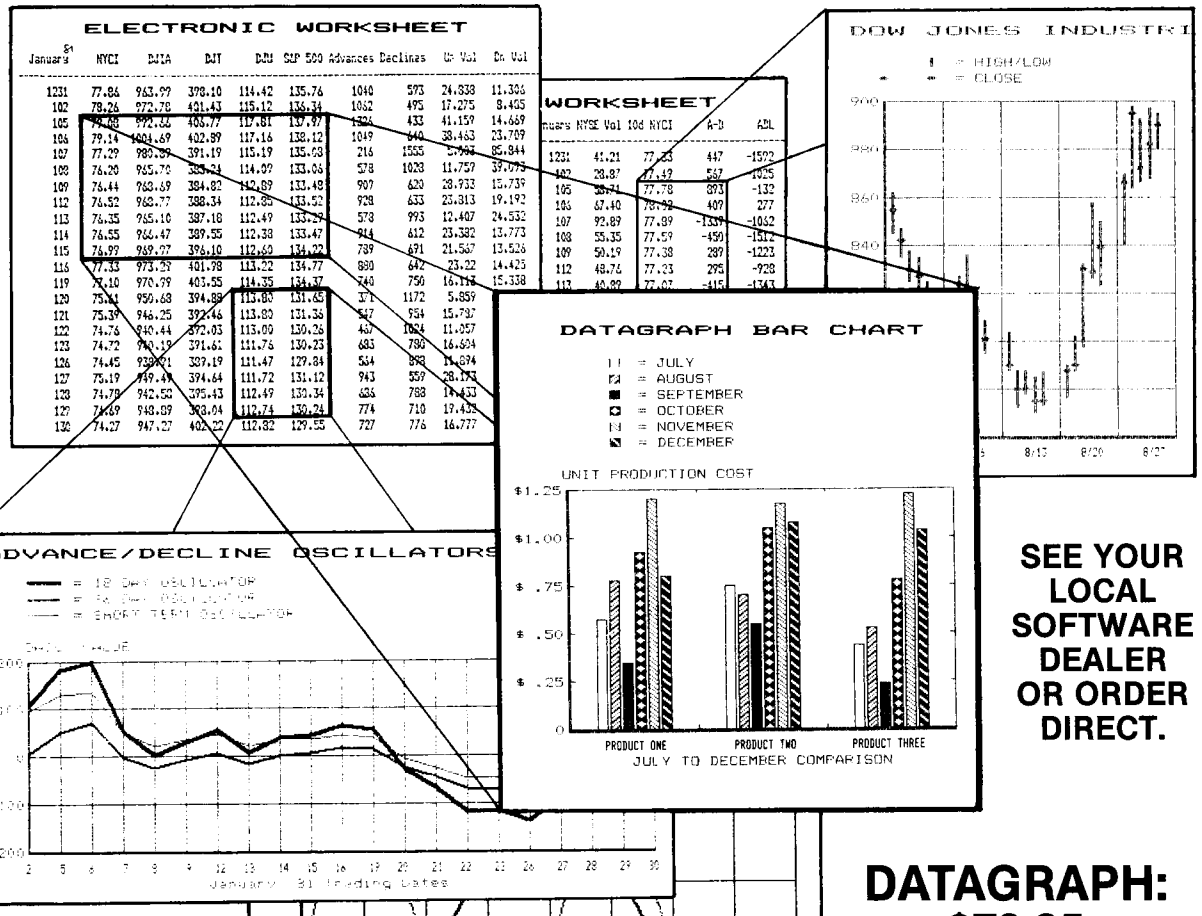

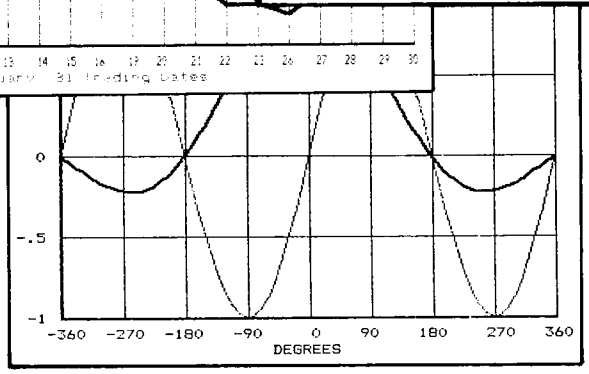

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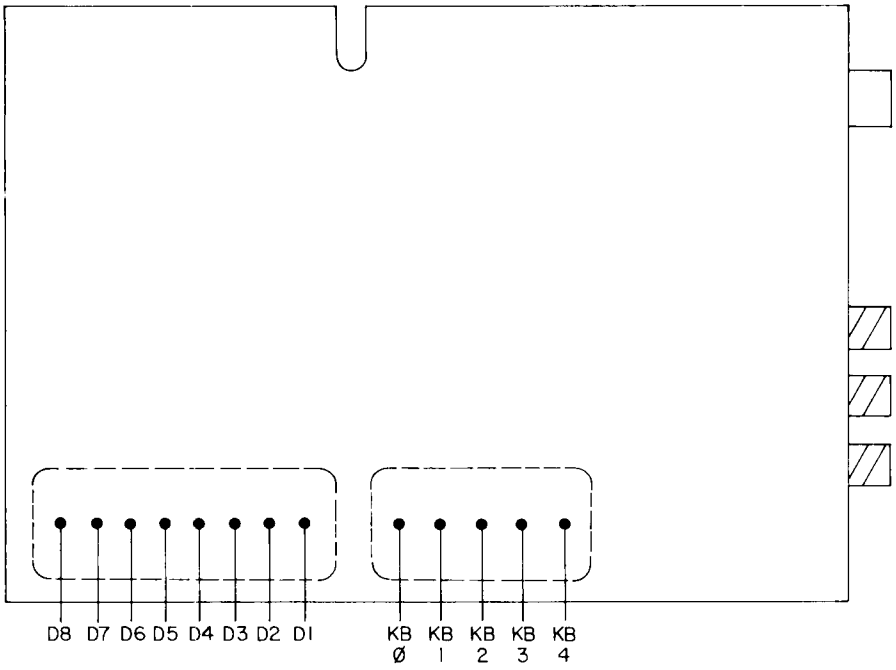

Fig. 2. Solder side of ZX-81 PC board, showing solder points for keyboard ribbon sockets.

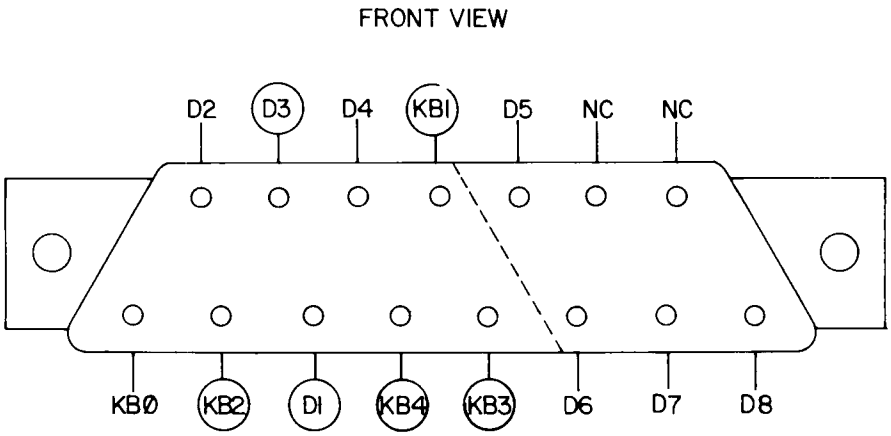

Fig. 3. Male 15-pin subminiature connector.

Wire each set of keys in daisy-chain fashion using short lengths of insulated wire, again as in Fig. 1. Keep the runs as short as possible because we are actually stringing address lines! Wire the space key into the space bar and parallel wire both shift keys. The ability to now shift with either hand will increase your speed more than any other factor.

The TS-1000 is durable and very forgiving if handled carefully and if strict attention is given to eliminating static build-up.

Making the Connection

The connection is the only difficult part and should be done carefully to avoid damage. Do not open the case unless you have owned the micro at least 90 days, because opening the computer voids the warranty. The TS-1000 is durable and very forgiving if handled carefully and if strict attention is given to the elimination of static build-up. Do not wear sweaters or synthetic clothes while working. Do not work around carpet or large plastic sheets. Always touch a heavy metal object before touching the circuit board. This will discharge any static.

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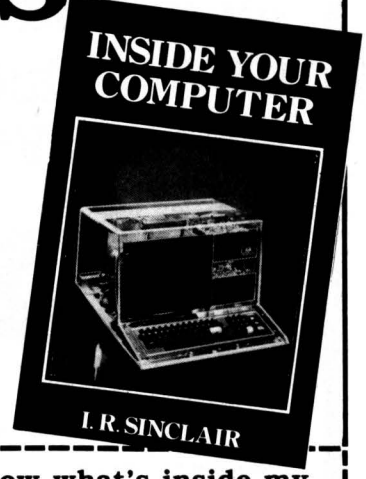

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The use of a quality low-wattage soldering pencil will insure against voltage transients from the iron.

Open the computer by removing the three small screws under the rubber pads on the bottom of the case. When the bottom is lifted, you will be looking at the solder side of the PC board, and the keyboard socket connections will be in the lower right-hand corner. Their numbering is as shown in Fig. 2. Connect to the TS-1000 (ZX-81) at the socket solder points and carefully solder to a four-inch strip of ribbon cable. Connect this to a male 15-pin subminiature connector as in Fig. 3. This connector will later be mounted into the top right-hand corner of the original TS-1000 (ZX-81) case. The matching female connector is attached to our new keyboard by a ten-inch ribbon cable to match the connections in Fig. 3.

When soldering to the computer's sockets, use as little heat as possible since you are near small blocking diodes. These connections should be made as quickly as possible using pretinned leads of the four-inch ribbon cable. Use as little solder as possible and double check here for solder bridges.

Connect the new keyboard to the TS-1000 or ZX-81 and test each key for proper input. If you only get a blink of the cursor and no character, you probably have a key that is closed or you have shorted the horizontal and vertical matrix lines by wiring to the wrong pin or socket connection. If you get an input, but for the wrong character, your lines are wired to the wrong point on the computer. Unplug the surplus keyboard; entry from the original keys should return to normal.

Although there are commercial keytops available in the TS-1000 format, there is a less expensive method.

Keytops Are Easy

Although there are commercial keytops available in the TS-1000 format, there is a less expensive method. Most popular computer magazines have close to full-size color ads of the original keyboard. Cut out the individual keys and neatly glue them to their respective keytops using white glue. The plastic keytops should be lightly sanded before applying the glue. Once these "decals" have completely dried, apply three or four coats of clear nail lacquer to each decal to protect them from wear. If done carefully, the appearance is surprisingly good.

You can install the keyboard into its own case, but it works just as well without one. After all, you are going to use it mainly for program entry. Above all, don't put the original unit into a larger case. Keep the original unit small and portable. That way, you can put it in your lunch box and take it to work or put it in your suitcase for out-of-town trips. What other 16K computer will fit into your coat pocket?■

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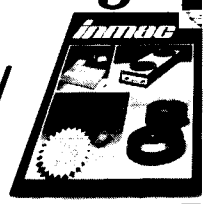

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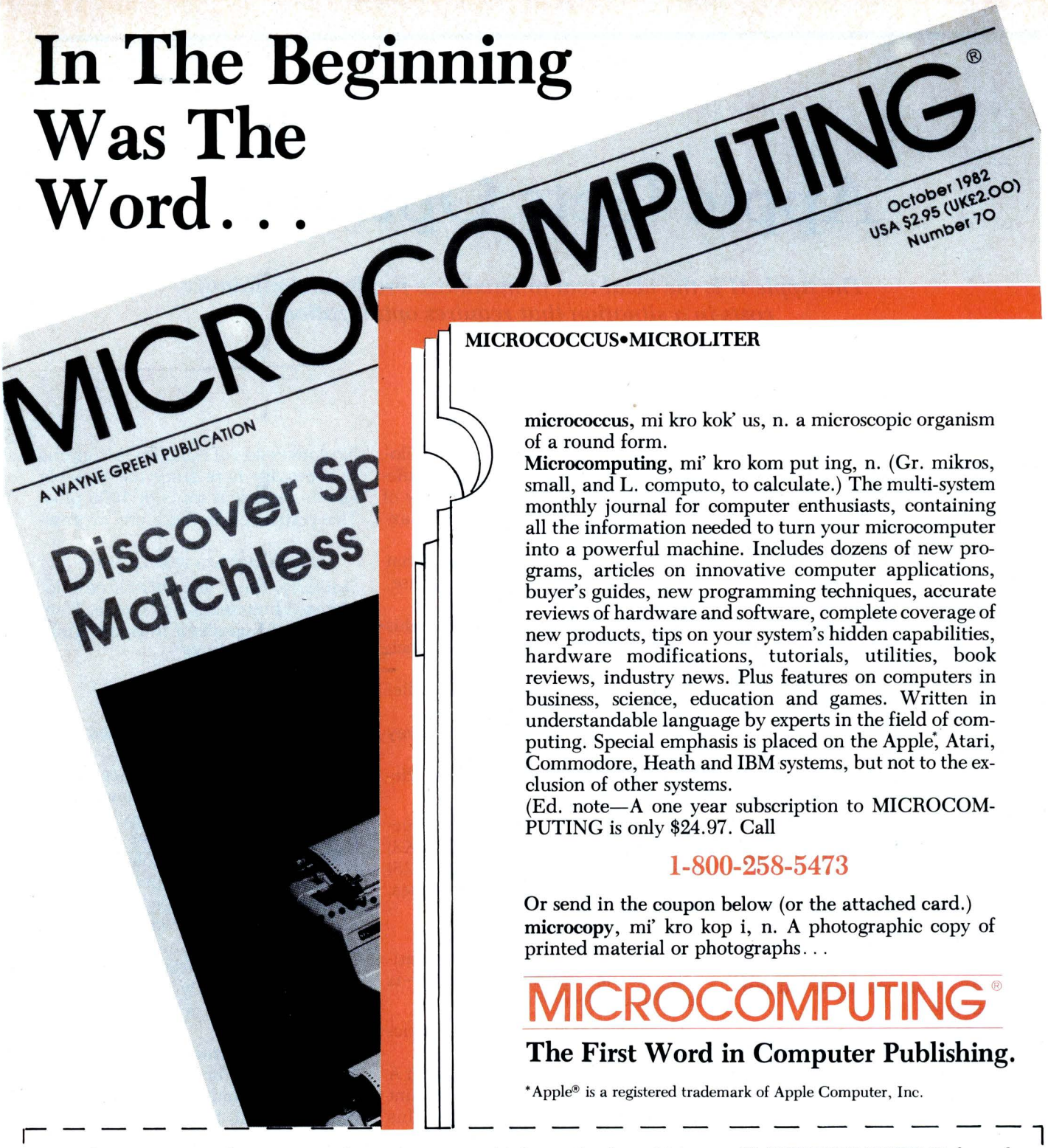

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Apple Gets Optimal

The Apple II is the ideal tool to maximize profits and minimize costs in a situation that requires optimization.

By Margaret Morris

A hospital dietician is trying to stay within a budget while meeting patients' nutritional needs.

A manager needs to hire new personnel to meet increased demand.

A financial adviser must handle a client's various investments to give him a maximum profit.

While these three people face different problems, they share one concern: They must maximize profits or minimize costs while maintaining certain constants. If you find yourself in such a situation, this program, written on an Apple II Plus with 48K, could help.

You must first define a problem before you can solve it. You can do so by following three steps:

- Decide what value is to be optimized
- Define this value in terms of all variables affecting it
- List all restrictions on these variables

The following examples illustrate this procedure.

Example One: The Drug Pushers

A pharmaceutical plant makes three brands of analgesic: Pain Relief, Pain-Away and Pain Remover. The same two ingredients are used in all three brands, but in different amounts. This information, along with production cost and revenue, is summarized in Table 1.

The plant has available 65 kilograms of ingredient A and three kilograms of ingredient B. How many of each brand should be made for maximum profit?

First, you need to decide what value is to be optimized. In this case, profit is to be maximized.

Second, you need to define this value in terms of all variables affecting it.

Let X1 = the number of Pain Relief pills (in units of 1000 pills).

Let X2 = the number of Pain-Away pills.

Let X3 = the number of Pain Remover pills.

The formula is Profit = Revenue - Cost. Revenue = (3.5)(X1) + (3.8)(X2) + (4.6)(X3). Cost = (1)(X1) + (1.25)(X2) + (2)(X3). Filling in the values, we get:

Profit = (2.5)(X1) + (2.55)(X2) + (2.6)(X3)

This expression defining the variable to be optimized—profit—is called the objective function.

Third, you need to list all restrictions on the variables.

Sixty-five kilograms of ingredient A are available, so the total amount used cannot exceed this value. This restriction can be expressed in the formula: Total amount of ingredient A used ⩽ Total amount available, or

(100 mg) X1 + (500 mg) X2 + (1000 X3) ⩽ 65000 grams

No conversion of milligrams to grams is necessary here since the variable names represent units of 1000 pills. The restriction is therefore expressed:

$$100\ X1 + 500\ X2 + 1000\ X3 \leqslant 65000$$

Similarly, there are only three kilograms of Ingredient B available. Total amount of Ingredient B used ⩽ Total amount available, or

$$100\ X1 + 70\ X2 + 50\ X3 \leqslant 3000$$

These restrictions are called constraints.

There are two more rather inconspicuous constraints: Both variables must be nonnegative, since it is impossible to produce fewer than zero pills. To find accurate solutions, this program demands that all variables be nonnegative. However, you don't need to include this constraint when entering the problem in the computer.

Note that the variable to be optimized appears only in the objective function and always has a coefficient of one.

The problem must be put in a particular form before it can be entered into the computer. The objective function must be expressed as an equality with all variables on the left and all constants on the right. Constraints must be expressed as inequalities (⩽). In the constraints, too, variables should be on the left and constants on the right.

If one of the original constraints is an equality, it must be rewritten as two inequalities. Thus, x + y = 10 becomes

	Ingredient A (mg/pill)	Ingredient B (mg/pill)	Production Cost ($/1000 pills)	Retail Price ($/1000 pills)
Pain Relief	100	100	1	3.5
Pain-Away	500	70	1.25	3.8
Pain Remover	1000	50	2	4.6

Table 1. Sample analgesics with ingredients, cost and revenue.

Address correspondence to Margaret Morris, PO Box 5824, APO San Francisco, CA 96366.

$x+y \geq 10$
$x+y \leq 10$
or
$-x-y \leq -10$
$x+y \leq 10$

Here, the original constraint has been rewritten as two inequalities using (≤), with variables on the left and constants on the right. It is now in the required form.

Returning to our example, note that the constraints are already in the correct form. However, you must rewrite the objective function thus:

Profit − (2.5) X1 − (2.55) X2 − (2.6) X3 = 0

The problem is now ready to be entered into the computer.

The program asks first for values in the constraints, then for those in the objective function. Once these values are entered, they are displayed and corrections can be made. In our example, the display would be:

```
 100     500   1000  65000
 100      70     50   3000
-2.5   -2.55   -2.6      0
```

Note that the coefficient of the variable to be optimized (profit) is not entered.

Once these values are entered, the computer takes over. Results are printed out as shown in Fig. 1. The maximum profit that can be made on the pills is $156. To achieve this profit, the plant should manufacture 60,000 Pain Remover pills and forget the other two brands.

The slack variables show how much slack there is in the constraint—the amount necessary to make the constraint an equality. Based on the results, the constraints can now be rewritten as follows:

100 X1 + 500 X2 + 1000 X3 + (5000) = 65000
100 X1 + 70 X2 + 50 X3 + (0) = 3000

Examination of the slack variables can reveal what changes should be made to improve the optimum solution. Note that there is no slack in the second constraint, which expresses the amount of ingredient B used in relation to the amount available; all of ingredient B is used. However, five kilograms of ingredient A are left over. This suggests that more of ingredient B should be obtained. Suppose that an additional kilogram of ingredient B is obtained. This changes the second constraint.

Constraint (2) 100 X1 + 70 X2 + 50 X3 ≤ 4000

The new results are:

VARIABLE 3 IS 56.6666667
VARIABLE 2 IS 16.6666667
ALL OTHER VARIABLES AND SLACK VARIABLES ARE EQUAL TO ZERO
OPTIMUM SOLUTION TO THE PROBLEM: 189.833333

Program listing. Linear Programming program for the Apple II Plus.

```
10  REM   LINEAR PROGRAMMING
20  REM
30  REM   MARGARET MORRIS
40  REM
50  HOME : CLEAR
60  REM
70  REM  INITIALIZE VARIABLES OPT$,VAR,CNS
80  INPUT "MAXIMIZE OR MINIMIZE? (MAX/MIN) ";OPT$
90  IF OPT$ = "MAX" OR OPT$ = "MIN" THEN  GOTO 120
100  GOSUB 280: REM  INVALID INPUT ALARM
110  GOTO 80
120  PRINT : PRINT : PRINT
130  INPUT "HOW MANY VARIABLES? ";VAR
140  PRINT : PRINT : PRINT
150  INPUT "HOW MANY CONSTRAINTS? ";CNS
160  DIM MTRX(CNS + 2,VAR + CNS + 2)
170  GOSUB 360: REM  BUILD SIMPLEX TABLEAU
180  GOSUB 1180: REM  FIND OPTIMUM SOLUTION
190  IF SOLN = 1 THEN  GOSUB 1740: REM  PRINT SOLN IF FOUND
200  PRINT : PRINT : PRINT
210  INPUT "MORE PROBLEMS? (Y/N) ";MRE$
220  IF (MRE$ = "Y") THEN  GOTO 50
230  IF MRE$ = "N" THEN  GOTO 260
240  GOSUB 280: REM  INVALID INPUT ALARM
250  GOTO 210
260  END : REM       **END OF MAIN PROGRAM**
270  REM
280  REM     **ALARM FOR INVALID INPUT**
290  REM
300  FOR NOISE = 1 TO 100
310 SOUND =  PEEK ( - 16336)
320  NEXT NOISE
330  PRINT : PRINT : PRINT "INPUT ONE OF THE CHOICES IN PARENTHESES"
340  PRINT : PRINT : RETURN
350  REM
360  REM     **BUILD SIMPLEX TABLEAU**
370  REM
380  GOSUB 470: REM  ADD VARIABLE LABELS
390  GOSUB 570: REM  ADD ID MATRIX
400  GOSUB 670: REM  ENTER VALUES OF COEFFICIENTS
410  GOSUB 940: REM  DISPLAY VALUES&ALLOW CHANGES
420  IF (OPT$ = "MAX") THEN  GOTO 460
430  FOR COL = 0 TO CNS + VAR
440 MTRX(CNS,COL) = MTRX(CNS,COL) *  - 1
```

More

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By making the change indicated by the previous slack variables, the profit was increased by more than $30. After the change is made, both slack variables are equal to zero—all of both ingredients are used in making 16,667 of the Pain-Away pills, 56,666 of the Pain Remover pills, and no Pain Relief pills.

Example Two: At the Mill

A factory manager must immediately increase production for a four-week period from the current 75,000 units per week to a minimum of 100,000 units per week. At present he has 30 experienced full-time employees, each producing 64 units per hour and receiving $5 per hour. New workers require tutoring on a one-to-one basis with experienced workers for at least one month. During this period, each new worker produces 30 units per hour and receives $3.50 per hour. The experienced worker is able to produce only 50 units per hour while tutoring.

Each experienced worker is willing to work eight hours overtime per week at $7.50 per hour. Due to fatigue, their production rate falls to 55 units per hour while working overtime. New employees are allowed to work only 40 hours per week.

How many new workers should be hired and how much overtime should be scheduled so that the temporary increase in production demand can be met while cost in employee wages is minimized?

First, decide what value is to be optimized. In this example, cost is to be minimized.

Second, define this value in terms of all variables affecting it.

Cost/week = $5 × (Total # regular hrs. worked by experienced employees per week)
+ $3.50 × (Total # hrs. worked by new employees per week)
+ $7.50 × (Total # overtime hrs. worked per week)

Total # regular hrs. worked by experienced employees/week = (# exp. emp.) × (# hrs. each works/wk.)
= 30 × 40 = 1200

Total # hrs. worked by new employees/week = (# new emp.) × (# hrs. each works/week)
= (X1) × (40)

Total # overtime hrs. worked/week = X2

Substituting back into the original expression defining weekly cost:

Cost/week = (5 × 1200) + (3.5 × 40)X1 + (7.5)X2
= 6000 + 140 X1 + 7.5 X2

This is the objective function, which defines the variable (cost/week) that is to be minimized.

Third, list all constraints affecting the variables. Production demand must be met—otherwise a customer is lost. Production/week ≥100,000 units.

Production/wk = (units/hr. produced by nontutors) × (# hrs. worked by nontutors/wk.)
+ (units/hr. produced by tutors) × (# hrs. worked by tutors/wk.)
+ (units/hr. produced by new emps.) × (# hrs. worked by new emps./wk.)
+ (units/hr. produced by OT workers) × (# hrs. overtime worked/wk.)

To simplify: Since tutors work on a one-to-one basis with new employees, the number of tutors must equal the number of new employees (X1). Since tutors are chosen from the 30 experienced employees, the nontutors can be represented by the difference (30 – X1). Also:

Units/hour produced by nontutors = 64

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```
OPTIMUM VALUES

SLACK VARIABLE FOR CONSTRAINT # 1 IS 5000
VARIABLE 3 IS 60

ALL OTHER VARIABLES AND SLACK VARIABLES ARE EQUAL TO ZERO

OPTIMUM SOLUTION TO THE PROBLEM: 156
```

Fig. 1. Figuring pill profits with the Apple.

```
OPTIMUM VALUES

VARIABLE 2 IS 240
SLACK VARIABLE FOR CONSTRAINT # 2 IS 14.375
VARIABLE 1 IS 15.625
ALL OTHER VARIABLES AND SLACK VARIABLES ARE EQUAL TO ZERO
OPTIMUM SOLUTION TO THE PROBLEM: 9987.5
```

Fig. 2. Determining personnel needs.

```
OPTIMUM VALUES

VARIABLE 2 IS 421.818182
SLACK VARIABLE FOR CONSTRAINT #2 IS 30
SLACK VARIABLE FOR CONSTRAINT #3 IS 58.1818181
ALL OTHER VARIABLES AND SLACK VARIABLES ARE EQUAL TO ZERO
OPTIMUM SOLUTION TO THE PROBLEM: 9163.63636
```

Fig. 3. Figuring factory needs.

Listing continued.

```
450  NEXT COL
460  RETURN
470  REM     * ADD VARIABLE LABELS *
480  REM
490  FOR ROW = 0 TO CNS - 1
500 MTRX(ROW,VAR + CNS + 1) = ROW + VAR + 1
510  NEXT ROW
520  FOR COL = 0 TO VAR + CNS - 1
530 MTRX(CNS + 1,COL) = COL + 1
540  NEXT COL
550  RETURN
560  REM
570  REM     * IDENTITY MATRIX *
580  REM
590  FOR ROW = 0 TO CNS
600  FOR COL = VAR TO CNS - 1 + VAR
610 MTRX(ROW,COL) = 0
620  NEXT COL
630 MTRX(ROW,ROW + VAR) = 1
640  NEXT ROW
650  RETURN
660  REM
670  REM     * ENTER CONSTANTS & COEFFICIENTS *
680  REM
690  HOME : PRINT : PRINT
700  PRINT : PRINT "ENTER THE COEFFICIENT OF EACH VARIABLE": PRINT
710  FOR ROW = 0 TO (CNS - 1)
720  PRINT "CONSTRAINT ";ROW + 1
730  FOR COL = 0 TO (VAR - 1)
740  PRINT "VARIABLE ";COL + 1
750  INPUT MTRX(ROW,COL)
760  NEXT COL
770  PRINT "CONSTANT ";ROW + 1
780  INPUT MTRX(ROW,CNS + VAR)
790  PRINT : PRINT : PRINT
800  INPUT "ANY CHANGES? (Y/N) ";CHG$
810  IF (CHG$ = "Y") THEN  GOTO 720
820  IF (CHG$ = "N") THEN  GOTO 850
830  GOSUB 280: REM  INVALID INPUT ALARM
840  GOTO 800
850  HOME : NEXT ROW
860  PRINT "OBJECTIVE ROW VALUES "
870  FOR COL = 0 TO VAR - 1
880  PRINT "VARIABLE ";COL + 1
```

More

Units/hour produced by tutors = 50
Units/hour produced by new emps. = 30
Units/hour produced by OT workers = 55

Substituting back into the previous expression:

$$\text{Production/week} = (64 \times 40 \times (30 - X1)) + (50 \times 40 \times (X1)) + (30 \times 40 \times (X1)) + (55) \times (X2)$$
$$= 76800 + 640\,X1 + 55\,X2$$

The production volume per week must meet the production demand:

$$76800 + 640\,X1 + 55\,X2 \geq 100{,}000$$
$$640\,X1 + 55\,X2 \geq 23{,}200$$

This is the first constraint.

Further analysis of the situation reveals two more constraints. The number of new employees cannot exceed the number of experienced employees, since the tutoring is done on a one-to-one basis.

new employees ≤ # experienced employees
X1 ≤ 30

Overtime is limited to eight hours per week and is available only to experienced employees.

hours overtime/week ≤ 8 × (# experienced employees)
$X2 \leq 8 \times 30 = 240$

In this example, too, note that both variables are nonnegative. To state the problem in the required form:

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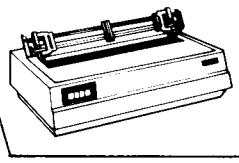

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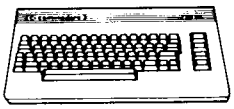

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Listing continued.

```
890  INPUT MTRX(CNS,COL)
900  NEXT COL
910  INPUT "VALUE OF OBJECTIVE CONSTANT ";MTRX(CNS,VAR + CNS)
920  RETURN
930  REM
940  REM     * DISPLAY VALUES AND ALLOW CHANGES *
950  REM
960  HOME : PRINT : PRINT
970  FOR ROW = 0 TO CNS
980  FOR COL = 0 TO VAR - 1
990  PRINT MTRX(ROW,COL);" ";
1000  NEXT COL
1010  PRINT MTRX(ROW,CNS + VAR)
1020  NEXT ROW
1030  PRINT : PRINT : PRINT
1040  INPUT "ANY CHANGES? (Y/N) ";CHG$
1050  IF (CHG$ = "Y") OR (CHG$ = "N") THEN  GOTO 1080
1060  GOSUB 280: REM  INVALID INPUT ALARM
1070  GOTO 1040
1080  IF (CHG$ = "N") THEN  GOTO 1160
1090  PRINT "TYPE ROW NUMBER, THEN COLUMN NUMBER, OF ENTRY TO BE CHANGED"
1100  INPUT "ROW NUMBER? ";ROW
1110  INPUT "COLUMN NUMBER? ";COL
1120  INPUT "NEW VALUE? ";NV
1130  IF VAR < COL THEN COL = COL + CNS
1140 MTRX(ROW - 1,COL - 1) = NV
1150  HOME : GOTO 970
1160  RETURN
1170  REM
1180  REM     **SIMPLEX METHOD TO FIND SOLUTION**
1190  REM
1200 SOLN = 0:FEAS = 0: REM  INIT FLAGS - NO FEASIBLE SOLUTION YET
1210 OP = 0: REM  NO OPTIMUM SOLUTION YET
1220  REM  FIND SMALLEST NUMBER IN OBJECTIVE ROW
1230 SM = MTRX(CNS,0):PCOL = 0
1240  FOR COL = 1 TO VAR + CNS - 1
1250  IF MTRX(CNS,COL) > SM THEN  GOTO 1270
1260 SM = MTRX(CNS,COL):PCOL = COL
1270  NEXT COL
1280  IF SM >  = 0 THEN OP = 1: GOTO 1420
1290  REM  FIND SMALLEST RATIO
1300 FD = 0: REM  FLAG TO INDICATE IF VALID RATIO FOUND
1310 VLD = 0: REM  VALUE OF CURRENT VALID RATIO
1320 SAV = 0: REM  SAVE VALUE OF SMALLEST RATIO
1330  FOR ROW = 0 TO CNS - 1
1340  IF MTRX(ROW,PCOL) <  = 0 THEN  GOTO 1380: REM  INVALID
1350 VLD = MTRX(ROW,CNS + VAR) / MTRX(ROW,PCOL)
1360  IF (VLD > SAV) AND (FD <  > 0) THEN  GOTO 1380
1370 SAV = VLD:PROW = ROW:FD = 1
1380  NEXT ROW
1390  IF FD = 0 THEN OP = 0: GOTO 1420
1400  GOSUB 1910: REM  ELEMENTARY ROW OPERATIONS
1410  GOTO 1200: REM  REPEAT SIMPLEX PROCESS
1420  GOSUB 1490: REM  ASSURE FEASIBILITY
1430  IF FEAS = 1 AND OP = 1 THEN SOLN = 1: GOTO 1470
1440  IF CHG = 1 THEN  GOTO 1200: REM  DUAL SIMPLEX USED
1450  IF FEAS = 0 THEN  PRINT : PRINT "      NO FEASIBLE SOLUTION"
1460  IF FEAS = 1 AND OP = 0 THEN  PRINT : PRINT "INFINITE NUMBER OF SOLUT
      IONS"
1470  RETURN
1480  REM
1490  REM     **DUAL SIMPLEX-ASSURE FEASIBILITY**
1500  REM
1510  REM  FIND SMALLEST # IN BASIS COL
1520 PROW = 0:CHG = 0
1530 SM = MTRX(0,VAR + CNS)
1540  FOR ROW = 1 TO CNS - 1
1550  IF MTRX(ROW,VAR + CNS) > SM THEN  GOTO 1570
1560 SM = MTRX(ROW,VAR + CNS):PROW = ROW
1570  NEXT ROW
1580  IF SM >  = 0 THEN FEAS = 1: GOTO 1720: REM  SOLN IS FEASIBLE
1590 SAV = 0: REM  VALUE OF SMALLEST RATIO
1600 FD = 0: REM  NO VALID RATIO YET
1610 CHG = 0: REM  DUAL SIMPLEX NOT USED YET
1620 VLD = 0: REM  VALUE OF VALID RATIO
1630  FOR COL = 0 TO VAR + CNS - 1
1640  IF MTRX(PROW,COL) >  = 0 THEN  GOTO 1680
1650 VLD = MTRX(CNS,COL) / MTRX(PROW,COL)
1660  IF (VLD < SAV) AND (FD <  > 0) THEN  GOTO 1680
1670 SAV = VLD:PCOL = COL:FD = 1
1680  NEXT COL
1690  IF FD = 0 THEN  GOTO 1720: REM  NO FEASIBLE SOLN
1700 CHG = 1: REM   DUAL SIMPLEX USED
1710  GOSUB 1910: REM  ELEMENTARY ROW OPERATION
1720  RETURN
1730  REM
1740  REM     **DISPLAY OF RESULTS**
1750  REM
1760  HOME
1770  PRINT : PRINT : PRINT "        OPTIMUM VALUES"
1780  FOR ROW = 0 TO CNS - 1
1790  IF VAR >  = MTRX(ROW,CNS + VAR + 1) THEN  GOTO 1830
1800 MTRX(ROW,VAR + CNS + 1) = MTRX(ROW,VAR + CNS + 1) - VAR
1810  PRINT : PRINT "SLACK VARIABLE FOR CONSTRAINT # ";MTRX(ROW,VAR + CNS +
      1);" IS ";MTRX(ROW,VAR + CNS)
1820  GOTO 1840
```

Minimize: Cost/wk – 140 X1 – 7.5 X2 = 6000
Subject to:
Constraint (1) – 640 X1 – 55 X2 ⩽ – 23,200
Constraint (2) X1 + 0 X2 ⩽ 30
Constraint (3) 0 X1 + X2 ⩽ 240
X1 ⩾ 0; X2 ⩾ 0

The display of values entered should be as follows:

```
-640   -55   -23200
   1     0       30
   0     1      240
-140   -7.5     6000
```

Results are shown in Fig. 2.

The manager must hire 16 new employees and schedule all experienced employees to work eight hours of overtime per week to meet production demand. The total amount of money spent on employees' wages per week is slightly more than $9987.50 (due to rounding off of variable one).

The slack variables in this case show that:

1) since slack variable one is zero, production demand is being met exactly;

2) since slack variable two is 14.375, then 14 more employees could be hired should it become necessary to further increase production; and

3) since slack in constraint three is zero, all experienced employees are working the maximum allowed overtime.

Suppose cost must be further minimized, so all experienced employees are allowed to work 16 hours of overtime per week. This changes the third constraint to:

$$X2 \leqslant 480$$

New results are shown in Fig. 3.

By making this change, cost has been decreased by more than $820 per week. No new employees are needed, and the total number of overtime hours worked per week must be 422. If it becomes necessary to further increase production, overtime hours can be increased by 58 and as many as 30 new workers can be hired.

Conclusion

In conclusion, this program computes optimum solutions to problems arising in many areas of the business world. Applications include maximizing profit and minimizing costs when dealing with transportation of products, blending of different materials, investment decisions, staffing problems, nutritional requirements in food production, and any other problem that can be expressed in the indicated form. ■

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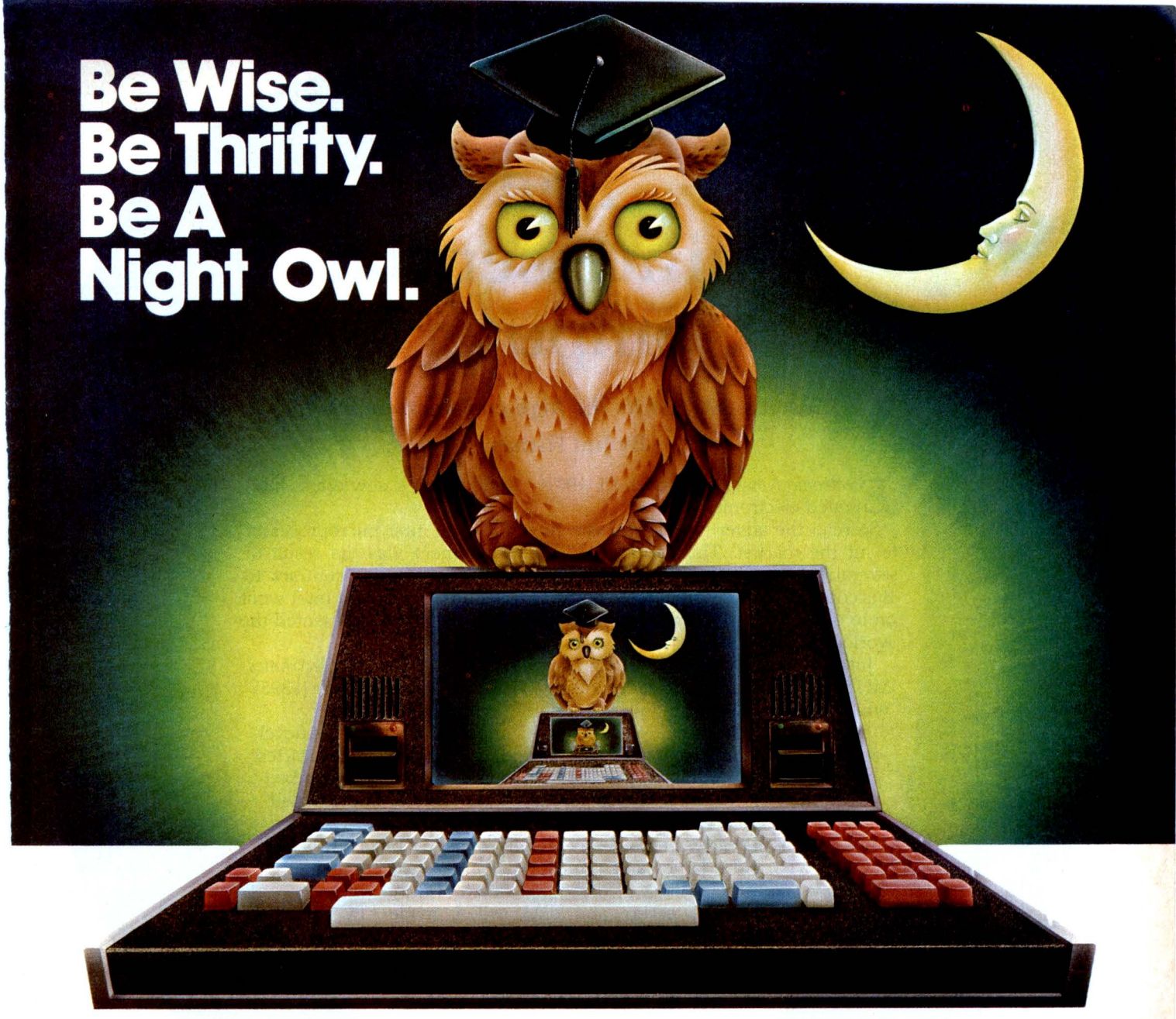

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The Quintessential Computer?

Epson's QX-10 hits the high-end micro market.

By Jim Hansen

Electronic News, November 15, 1971: "Announcing a new era of integrated electronics."

So read the advertisement for the Intel 4004, the first microprocessor to hit the market. This 2300 transistor development was the result of several years of effort by Intel Corp., which was under contract to Busicom, a Japanese calculator company now out of business. Intel went on to develop the 4040 and the 8008 and, in April of 1974, presented the world with the 8080.

Just nine months later, in the January 1975 issue of *Popular Electronics*, MITS published an article describing the Altair computer kit ($395), which used the 8080. The microcomputer revolution had begun.

In the eight years since, the personal computing industry has developed rapidly. Initially, it was common for a company to get started on a few hundred dollars. For example, one pioneer began in a bedroom making memory boards for the Altair. Apple, like Hewlett-Packard, started in a garage.

Most of the early companies eventually vanished, but a few have survived. New larger and professionally managed companies have taken the places of those that failed. Tandy, with the ubiquitous TRS series, and IBM, which made "PC" a generic term in less than a year, are two examples.

Looming ahead all along were the Japanese; their invasion into the microcomputer hardware market seemed inevitable. The Japanese invasion was expected by everyone, from the consumer who found value in Japanese electronics to the American microcomputer industry, which would rather not see it. Now, finally, the invasion is here.

Epson, first with the HX-20 and now with two versions of the QX-10, has introduced two competitive computing systems.

In this first of a three-part review of the QX-10 computing system, we'll look at the QX-10's hardware. Next month we'll report on the operating systems and software available for the QX-10 and in June

we'll describe Epson's new printer, the FX-80, and how it works in conjunction with the revolutionary Valdocs operating system.

Outside the QX-10

Three components make up the QX-10: a keyboard, a low-profile case for the computing electronics and disk drives, and a high-resolution monitor, which is normally placed on top of the electronics cabinet. The system weighs about 39 pounds.

Two versions of the keyboard are available. The ASCII version (with 103 keys) offers a standard layout in the main typing area, ten function keys (with clear, removable caps that allow the user to apply personal legends), four additional special-function keys without caps, a screen editing cluster (which consists of the usual direction arrows for cursor control, insert, delete, home and clear) and a calculator pad of 19 keys.

The second keyboard design is called the "HASCI" (for Human Applications Standard Interface). It has been set up with a Selectric typewriter-like layout in the main typing area.

The function keys are organized into four clusters. The Systems Controls group includes Stop, Help, Copy Disk and Undo keys. The File Controls are labeled Store, Retrieve, Print, Index and Mail. The Applications section consists of Menu, Calculator, Schedule and Draw keys. The Typestyles section allows choice of normal, bold or italic styles and type size. (Next month, I'll explain all these keys and what they do.)

The editing and calculator pads are generally similar in layout and functionality to those on the ASCII keyboard.

The keyboard case has adjustable legs that allow the rear of the keyboard to be set to three elevations. (The medium setting felt best to me.) The keys are of the mechanical switch type (as opposed to reed switches).

The keyboard case is connected to the computer electronics case with a coiled cable that can be comfortably stretched about four feet. The traditional computer center hacker mode (feet on desk, keyboard on lap) is easily supported by the QX-10.

The electronics enclosure is four inches high, 20 inches wide and 13 inches deep. A small dc-powered fan provides forced air cooling. The front apron (facing the user) provides a plug for the keyboard cable on the left side, two double-density, double-sided, 5¼-inch disk drives (made by Epson) and a recessed reset switch, which is easy to get to, but not easily susceptible to accidental hits.

The power switch is located on the right side of the disk drive case. The rear apron has connections for the CRT monitor, the ac power cord, a light pen jack, the volume control for the bell signal (provided by a small oval loudspeaker), jacks for the Centronics-compatible parallel printer port, a serial RS-232 interface, a DIP switch of eight switches and the exhaust port for the fan.

The CRT monitor is of the slow-persistence, green type. The face, which is matted to diffuse reflections, measures about 11½ inches diagonally. It connects to the back of the electronics enclosure with a two-foot cable.

A brightness knob and a recessed, screwdriver-adjustable focus control are located on the back of the monitor case. The monitor is light, but slightly front-heavy because of the weight of the CRT glass face.

The display itself is made up of 25 rows of 80-character lines. Characters in the standard font are mapped in a cell 16 dots high and eight dots wide; legibility is impressive. Graphics resolution is single-density, 640 dots horizontally by 400 vertically. Due to the sweep speeds and the electrical interface to the CRT monitor, conventional monitors are not useable with the QX-10.

The styling of the QX-10 is about as pleasing to the eye as any system on the market today. It's a light cream color, the same as Epson's printers. The CRT is exceptionally easy to move about to minimize glare and reflections.

The QX-10 computer system and FX-80 printer from Epson. The QX-10 runs a Z-80A with up to 256K of memory, and comes standard with 64K, a parallel printer port, a serial port, the ASCII keyboard and the CRT monitor (shown here). The software supplied with this $2500 system includes CP/M 2.2, CP+ and Microsoft Basic, version 5. The FX-80 printer, not yet on the market, is especially suited for use with the Valdocs system offered with the QX-10. (All photos by Jim Hansen.)

A Capsule Look At Epson's QX-10

Uses
Business, professional and personal.

Manufacturer
Epson America, Inc., 3415 Kashiwa St., Torrance, CA 90505 (213-539-9140).

Base List Price
$2995.

Standard Features
Detachable HASCI keyboard with its own processor; two 5¼-inch disk drives with a capacity of 340K per disk; multiple type fonts and high-resolution graphics capabilities on a monochrome display; 640-by 400-dot screen format; Z-80A microprocessor with 256K of main memory; a separate display processor chip with 128K of video-dedicated memory; a DMA controller and an interrupt controller; a built-in calendar/clock with battery back-up; an RS-232C interface; a parallel printer interface; a light pen interface; and internal space for up to five peripheral cards.

Proportions
Entire system weighs 38.2 pounds; CPU measures 20.3×13.6×4.1 inches; monitor measures 12.4×13.6×10.6 inches; keyboard measures 20×8.9×1.9 inches.

Software
Valdocs or C/PM.

Documentation
Operations Manual.

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The monitor can be positioned to face any direction, although no provision was made to allow it to be tipped vertically. Disk drive access is convenient, although with the keyboard in the fully raised position and pushed close to the electronics, clearance to the loading slots can be tight.

An Inside Look at the QX-10

Access to the electronics of the QX-10 is gained by first removing the accessory cover, the top cover screws, the two screws in the accessory bay and two more along the top right edge, underneath plastic dress plates. The two disk drives are mounted directly onto the cover and are lifted away from the electronics, with the cover, after the interconnect cables have been disconnected.

The accessory bay, normally the only area a user will want to see, has five option board connectors and 24 sockets for additional 64K RAM chips. The main motherboard measures 12×15 inches. A switching mode power supply is mounted vertically along the right edge of the case.

A large metal ground plate completely covers the underside of the main circuit board; the circuit board, power supply and protective ground from the ac power cord are bonded to this plate. Extensive power line filtering is provided in the power supply.

The QX-10 uses a Z-80A microprocessor running at 4 MHz; it comes standard with 64K of memory installed. Sockets on the main board (located in the accessory area) are provided for an additional 192K of user RAM.

Two double-sided 5¼-inch floppy disk drives (double density) with 48 tracks per inch provide a total of about 640K of online storage. A NEC uPD-765A disk controller is used to handle the two disk drives.

Seven channels of DMA are available on the system. Two of them are assigned to the CRT and floppy disk controllers; the remaining five are accessible by the option cards.

The CRT controller and main circuit boards are of obvious CAD/CAM design and are made with an epoxy-fiberglass substrate. The power supply printed circuit board is single-sided and made of a phenolic-like material.

All boards are extensively bypassed with ceramic capacitors at each chip. A bus bar distributes power across most of the motherboard to lower the power supply distribution impedance, thereby reducing noise.

Both of the QX-10 systems I examined contained integrated circuits from Texas Instruments and Intel Corp. The predominent Japanese supplier for the remaining semiconductors was NEC.

The CRT controller logic is contained on a separate PC board and is mounted, piggyback fashion, on the main board. It uses a NEC 7220 CRT controller chip and has between 32 and 128K of memory, depending on whether the QX-10 is running as a CP/M or Valdocs system. (This memory is in addition to that used by the Z-80A main processor and is used only by the CRT processor.)

The difference between the CP/M and Valdocs controllers is that ASCII characters are formed in the usual manner by a character generator in the CP/M-based system, but the Valdocs version forms them as bit images in a graphics mode. The result is a set of character fonts that are "soft" and can be changed, or even designed, by the user.

Fonts now available with Valdocs include the standard font and italic and bold versions of both. Any character can be overstruck in the Valdocs system. Text and graphics also can be intermixed, and, more importantly, printed (when using the new FX-80 printer). More on that next month.

A 3.6-volt nicad battery provides power for the 2K of CMOS nonvolatile RAM and the calendar/clock in the system. The battery is held in place on the main board with two tie wraps and has its own connector, rather than being soldered into place. These batteries probably will last two or three years before needing replacement.

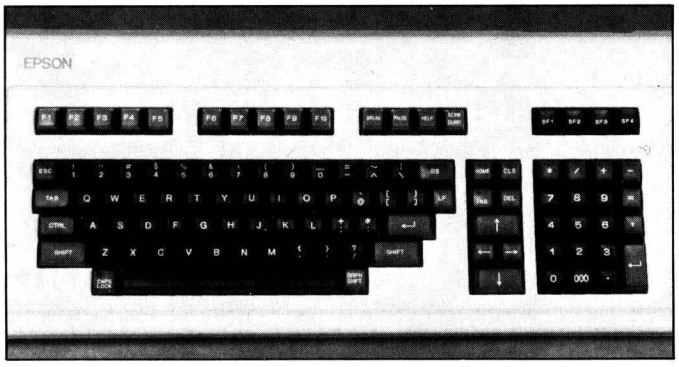
The two disk drives used in the QX-10 are made by Epson. They are something out of the ordinary. The drives are small (1.5 inches thick by 5.75 inches wide by nine inches deep).

A voice coil linear motor (instead of the usual stepper motor) is used to position the head, and you will find most of the electronics reduced to two custom-LSI chips. Each drive uses a little less than ten watts of power. Operation is exceptionally quiet; in fact, the sound of a disk turning inside its sleeve is noisier than the drives when stepping.

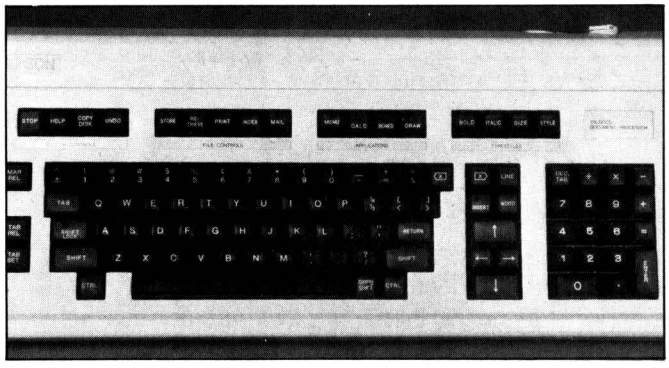
The keyboard is made up of three large plastic moldings; one holds the guides for all of the keys, completely covering the keyboard wiring. The other major moldings make up the top and bottom covers.

The keyboard electronics, which consists of six integrated circuits, a five-volt regulator and an Intel 8749, is positioned such that it is unlikely that a coffee spill on the keyboard is going to do anything electrically detrimental. If coffee is spilled, the keycaps will act like an umbrella, and the liquid will spill onto the plastic guide molding and run to the front edge of the keyboard case, away from all the electronics (although I didn't actually try this). This is the first keyboard I've seen with built-in bilges to take care of the most common of keyboard accidents.

The 8749 microprocessor is used to scan and preprocess keyboard data. A



The two keyboards offered for the QX-10. On the ASCII version (left), function keys F1 through F10 are equipped with removable clear plastic caps.



Legends can be inserted under the caps for special applications. The HASCI keyboard (right) has function keys preassigned to operate with Valdocs.

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ABCDEFGHIJKLMNOPQRSTUVWXYZ 1234567890

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simple and should be relatively inexpensive if it becomes necessary.

Software and Documentation For the QX-10

The QX-10 I reviewed came equipped with the ASCII keyboard, a CP/M 2.2 disk and two boxes (a full armload) of Peachtree software. The operating documentation consisted of a copy of the manual (paper-clipped together and almost done, by the looks of things) and a copy of *CP/M Primer*, by Stephen M. Murtha and Mitchell Waite. No other documentation or software was supplied with my evaluation unit, although production QX-10s will be shipped with CP+, a software package that makes CP/M more user friendly.

The operating manual is written in a friendly tone and, when printed and bound, will consist of 30 or 40 pages in a book about the same size as Apple manuals. Basically, the operations manual explains how to plug in the keyboard and monitor, turn on the system and insert a disk.

The *CP/M Primer* book is a competent introduction to CP/M, but it's certainly not a replacement for the documentation from Digital Research. In any event, it's possible to get far enough to copy the CP/M disk with it. . . if you already know enough to want to do that in the first place.

First-time users of the Peachtree software will be able to use it without severe migraines, due to the documentation and to the nicely done (but sometimes confusing) menus.

According to the Peachtree manuals, the software is written in 8080 code. My guess is that this is the same basic package sold to IBM in smaller notebooks—the Epson version is supplied in standard 8½ x 11 binders.

In any event, the software I used on the CP/M, ASCII-based system contains the Peachtree Peach Text Word Processor, Spelling Proofreader, PeachCalc, Calendar Management System, Mailing List Manager and Telecommunications (more on this software and other system documentation next month).

The other QX-10 system I used is the "full-house" Valdocs system. This means, QX-wise, that it has all the memory slots filled with 64K RAMs, and that the HASCI keyboard is used. This system can run CP/M, if you're so inclined, but you'll more likely want to use Valdocs, an applications program that grapples with the problems of the first-time user or nonprofessional computer user. A CP/M-like operating system called TPM actually handles the machine resources under Valdocs.

I've played around with the Valdocs keyboard, deliberately not reading the manual, just to see if a dummy can operate the system. Guess what? You can, and I'll tell you all about it next month. It's a remarkable system.

Commentary on the QX-10

Let me preface my subjective remarks on the QX-10 by telling you that I am an engineer in an American company competing with Epson in specialized areas. When I was asked to review this product, I eagerly accepted the assignment and began to get out my sharpest needles and most poisonous barbs. I determined that I would give this machine a fair review—and maybe hang it.

I've given both versions of the QX-10 a good looking over, and I cannot hang them. The only problems I've had are in trying to use the products two months before they actually go on sale. . . which will be about the time you read this review. (At this writing, all the documentation for the system was not available.)

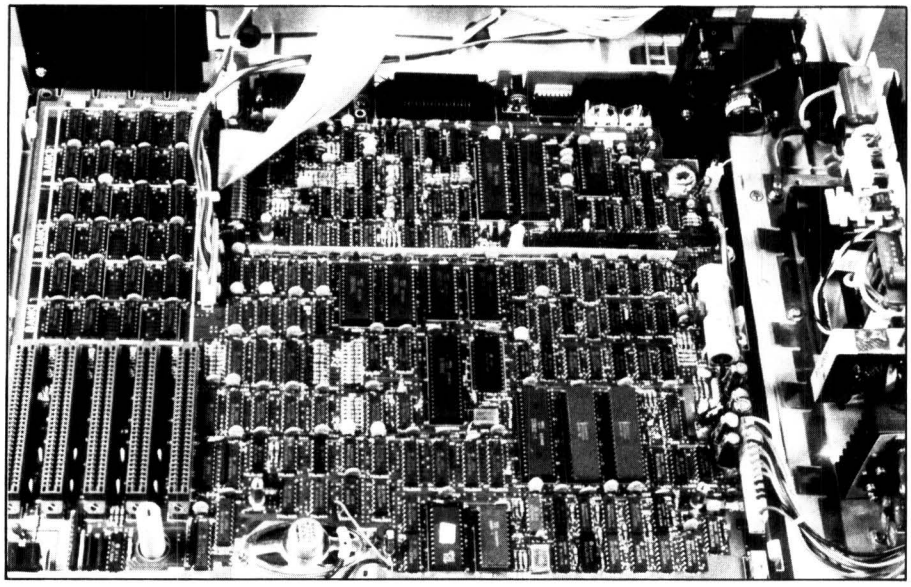
The Epson QX-10 is soundly designed and executed. I looked hard and found no evidence of kludging or shorting out anything in the name of economy. All the connectors have gold on them and are of quality manufacture. The printed circuit boards are heavy, with soldermasks on both sides of the double-sided boards. The circuit boards are completely silkscreened with component labels, and the layout is as professional and clean as you will find anywhere.

The CRT display is wonderfully clear. I particularly like the font; it's even better than the one used on the IBM PC, although this is clearly subjective. I spend a considerable amount of time sitting before computer terminals professionally, and I like this display better than any other I have used. The only feature lacking is a slow scroll, where text is moved vertically, like movie credits.

If I had a criticism of the display, it's this: it initially seemed to me that the CRT phosphor had a longer persistence than necessary. By this I mean that a character fades on, or fades off, slower than on other terminals I've used. Evidently, it's easy to live with, because a couple of weeks after using, I didn't notice it at all.

I like the disk drives. The loading is easy and positive, and unloading is even easier—just hit the button marked Push and the disk pops out about a half-inch. The disks have a quiet but reassuring "purr" to them as they go about switching tracks.

Externally, the QX-10 style is in



The main electronics board in the QX-10. This view shows the accessory area (on the left) and the switching mode power supply (on the right), used both for weight and for space economy. The fan used to ventilate the cabinet is shown on the back side, near the right corner. The cabling shown going toward the top of the photo is connected to the floppy disk drives, which are still attached to the cover. The loudspeaker used for the bell is shown along the bottom edge of the photo. The bell tone (which has a volume control on the back apron) can be adjusted loud enough to be heard over any din likely in a normal household.

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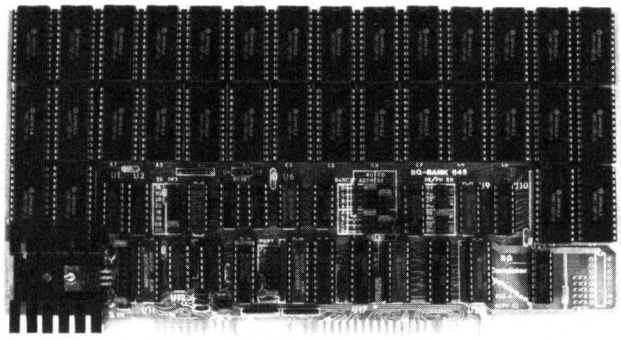

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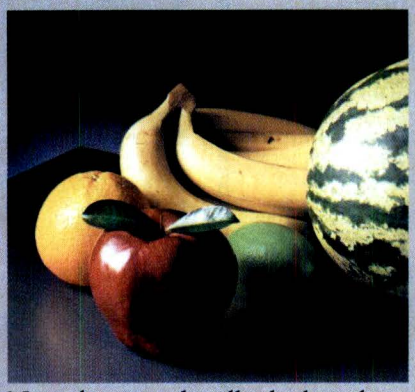

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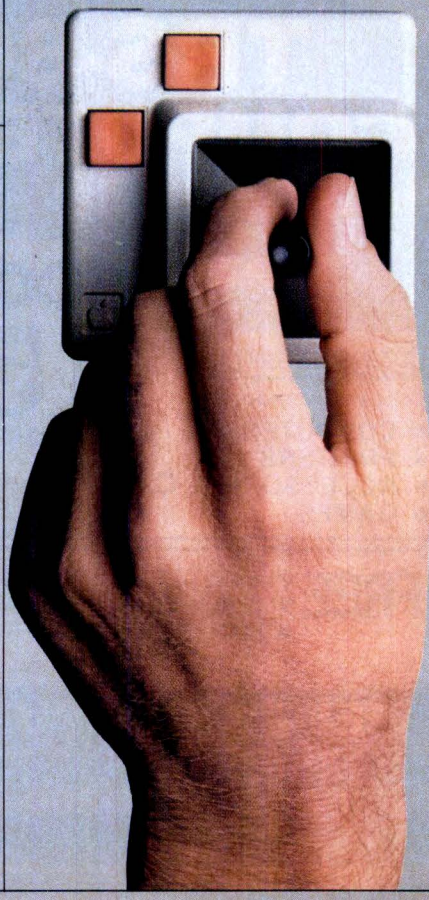

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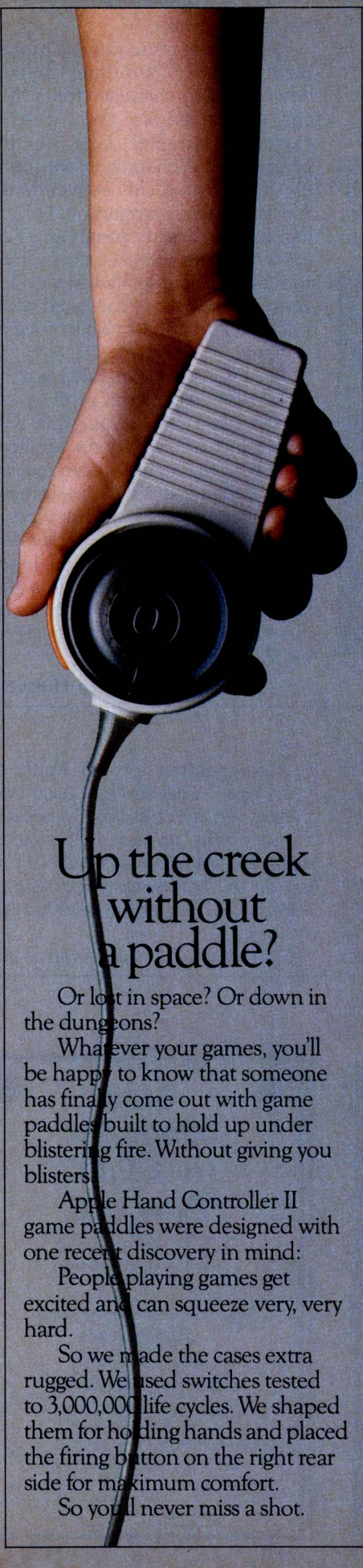

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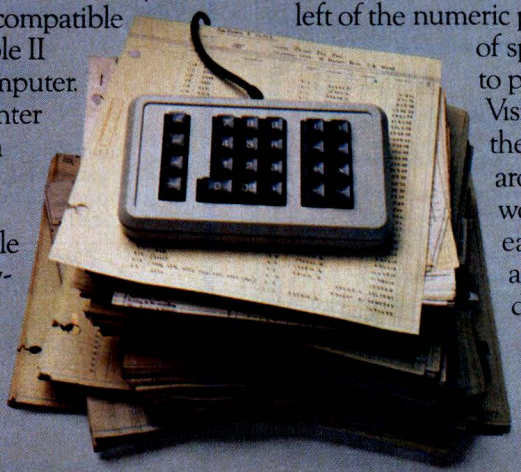
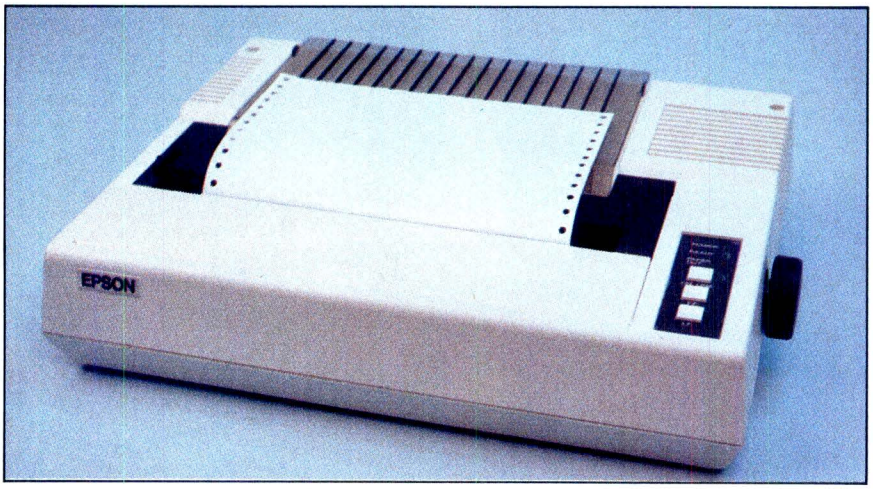


VisiCalc is a registered trademark of VisiCorp. Inc.

Epson Unleashes A "Universal" Printer

The FX-80 is the latest printer added to Epson's line of successful printing products. This 80-column printer, which bears some external resemblance to the MX-80, offers faster, quieter printing and a host of features that make it ideal for use with QX-10 computers running Valdocs software.



Epson's new 80-column printer, the FX-80.

Some of the more important features of the FX-80 printer include downloadable character fonts that can be added to the already-existing character sets in the printer, a 256-character font (double that found in conventional ASCII printers), proportional printing and increased thoughput. The FX-80 also can print at a slower rate in what is called a quiet mode—for times when the normal speed noise might disturb others in the office or at home.

The FX-80 has expanded graphics capabilities and can print several horizontal resolutions; this will increase its flexibility in applications with the higher screen resolutions becoming available on the new generation of personal computers.

Is this product the "universal" printer Epson says it is? In June, *Microcomputing* will provide a detailed report—in the tradition of our Printer Survival Kit series—on the FX-80.■

—Jim Hansen

typically squeaky-clean, designed-for-America Japanese fashion. The IBM system, whose style looked so good just a few months ago, now looks "boxy" by comparison. The QX-10 is light and easily moved around.

The technical manual (to be made available separately) was written in America (a real blessing) and is complete, thorough and leaves virtually nothing unsaid. It's so detailed that one appendix is devoted to listing all the pinouts of the ICs used.

Don't Believe in First Impressions

When I first glanced at the QX-10, I thought to myself, "Another CP/M system. This one would have been real competition for the Apple four years ago." That thought hasn't completely left me, but largely because I wonder why anyone still would be designing with Z-80s instead of jumping on the bandwagon and using the 8088 (as in IBM) or the 68000 in 16-bit systems.

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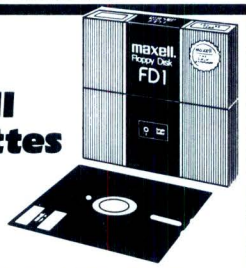

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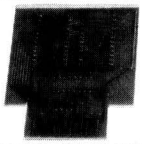

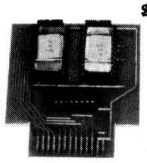

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the QX-10 computer system. Why a Z-80? As it turns out, there are several reasons.

The QX-10 is a refined, honed and finished product. Conceptual work apparently was started four years ago. The Z-80 was the obvious choice then. However, the QX-10 is not just a rebottled S-100 bus renegade; it's a system. Every component in it has been designed as a part of the system.

Virtually no American computer, save the Apple II, has had the luxury of four years of development, so the level of refinement in the QX-10, compared to other American products, is not surprising. On the other hand, not many American micro manufacturers can afford to keep a $2500 computer in development for that long.

A plethora of software is available for CP/M-based computers, so the Z-80 is a good choice if the advantages of a large, recognized software base are to be used.

The fact of the matter really is that most software available for CP/M systems is written in 8080 code, and doesn't even take advantage of the Z-80 as a superior processor. This same software, simply passed on through an assembler/translator, is currently being used on 8088-based computers, such as the IBM PC.

Until someone sits down and rewrites this giant software base, I doubt that any 8088 will execute CP/M-based software significantly faster than most Z-80-based systems do now.

This has been shown to be the case in several benchmarks comparing the IBM PC, the Apple II and other popular computer systems. Most of the timings have been within ten percent of each other. (In fact, the tiny, $99 Sinclair ZX-81 will wipe out almost all larger systems in floating point number-crunching, a point that must bother people with $5000 state-of-the-art computer systems.

The QX-10 offers a remarkably able computer system featuring hardware external to the Z-80A processor that boosts performance above that of many 16-bit machines. Care was exercised in refinements that are meaningful to us humans.

The keyboard should be carefully studied by IBM. (I find the IBM PC keyboard nearly unusable because of poor layout.) The QX-10 keyboard, about the same size as IBM's, has an organization that is a pleasure to use. You don't have to throw away a lifetime of typing experience on standard keyboards to use this system.

Miscellaneous

Two features are lacking on the QX-10 keyboard. The first is a dimple on the 5 key in the numeric pad. I don't miss it, but super number typers who can run a calculator by touch may.

I do miss autorepeat on the vertical cursor positioning keys (the up and down arrows). I would add that, too, if I were fixing the keyboard to my liking. But I can certainly live with it the way it is.

Nothing is missing on a stripped QX-10. It's an excellent computing system with printer and serial I/O ports built in. No extra expansion boards are required to drive a printer or modem, or to bring it up to a full 64K memory, or to give an 80-column display. . . These features are designed into the QX-10 and are standard. And better yet, you don't need a hundred outlets and a rat's nest of wiring in back of the machine to make it work.

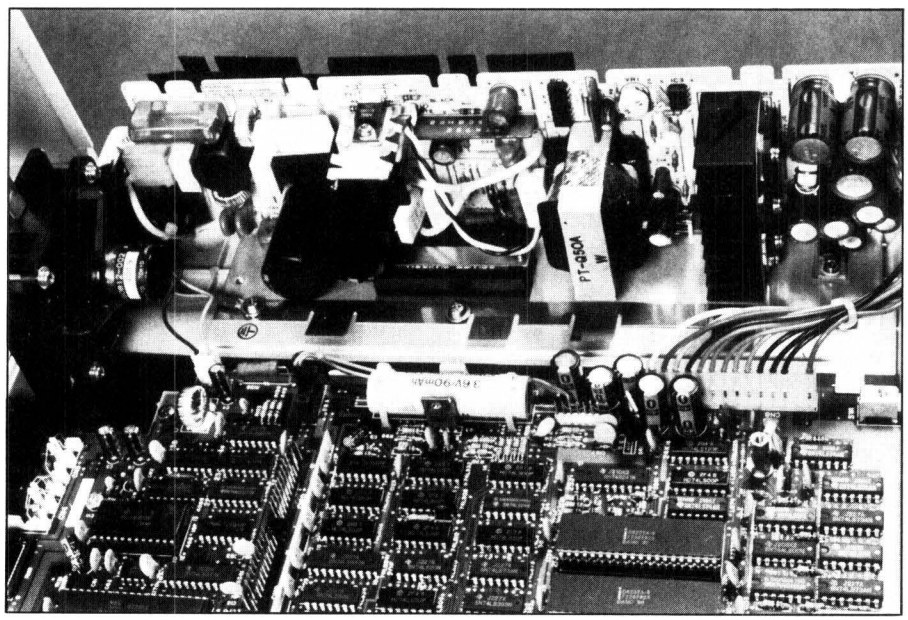
Several accessory boards currently are under development at Epson. I was told of three: two modem cards that connect directly to phone lines (one for 300-baud operation only, the other with 300/1200 capability); a printer spooler card to allow files to be printed in background while the rest of the computer is used for other functions; and a half-megabyte RAM-Disk card, which will allow operation of the computer at memory speeds instead of being slaved to that of the floppy disk.

This Month's Wrap-up

I'm actually overwhelmed by the QX-10 system. The hardware is well-done; it's designed superbly and should provide years of convenient, pleasant service. Notice that I said "convenient, pleasant service," not just "service." The screen and keyboard, the most important features in a computer or terminal, are without peer.

Would I recommend this system? Yes—an unqualified yes to any beginning computerist who needs a practical system for small-business accounting, text processing and general-purpose computing, and an unqualified yes to experienced users whose computing needs can be satisfied by CP/M-based software or by the Valdocs system I'll describe next month.

And would I purchase either the CP/M or Valdocs system for myself? Nope. I got mine when they wanted me to do this review, and I ain't givin' it back. You hear that, Epson? You ain't gettin' it back!■



A detailed photo of the switching power supply, fan and nicad battery. The battery is used to maintain 2K of CMOS memory and the calendar/clock, a standard feature in all QX-10 systems. The Valdocs system has an appointment book feature that uses the clock; appointments or "wake-up" calls, if you will, are entered into the appointment book. When the appointment time is reached, the system announces the fact, regardless of what the computer is doing at the time. (Of course, this doesn't "bomb" anything; it just advises of the appointment and then lets you carry on where you were before.)

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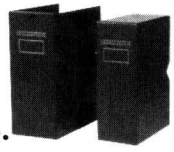

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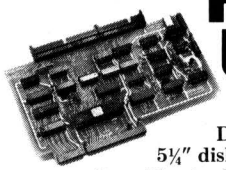

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Pint-Sized Powerhouse

The HX-20 is smaller than a breadbox, but, with 16K RAM and 8K ROM, this four-pound micro has plenty of power. It's proof that good things come in small packages.

By Ray Albrektson

Fig. 1. Examples of Epson HX-20-generated graphics (actual size).

Is there such a thing as a computerholic? If so, I must be one.

Not long ago I was beginning to feel the onset of withdrawal symptoms as a result of being forced to leave behind my trusty Heath H89 during travels in electricity-less parts of Asia. It seemed that portable computers were either overgrown pocket calculators, or suitcases the size of sewing machines, with nothing in between.

Salvation for a Computerholic

A ray of hope appeared last spring when an amazingly small and portable computer was displayed by Epson at a major computer show. The Epson HX-20 seemed to offer all that a truly portable computer could. It packed 48K into a package as big as this magazine (but a little thicker), and it had a full-size QWERTY keyboard and a built-in microcassette recorder for bulk memory.

A few months later, I received one of the first HX-20s to hit the market. My first impression was one of incredulous delight. Could this tiny handful really be as intelligently designed as it appeared? Aside from a couple of negative aspects, the HX-20 turned out to be everything it seemed—its positive features proved overwhelming.

One notices the keyboard immediately. For those who were so rash as to try to adapt the Radio Shack or Sharp portables for word processing, the full-sized keyboard of the Epson is a revelation. It uses a more or less standard key layout (I prefer colon and quotation marks over the semicolon and apostrophe, but let's not quibble), and the feel is acceptable. The spring pressure feels a bit spongier than I think is ideal, and if it is not pressed straight down you can feel a slight amount of friction.

The keys are practically noiseless in operation; the HX-20 could be used discreetly in a classroom or boardroom for note-taking.

The display represents a clever compromise. Unlike the Sony Typecorder, which has a one-line display 80 characters wide, the Epson can display four lines of 20 characters. Through the use of virtual scrolling, the Epson screen serves as a window onto a display area that can be much larger—as large as 255 characters wide.

The physical screen of 20 letters by four lines is a window on a much larger "virtual screen." This opens the vista of running screen-hogging electronic spreadsheet programs, such as SuperCalc, if such software should

Ray Albrektson, ACPO Box 51, Quezon City 3001, Philippines, is extension faculty for the Asian branch of the International School of Theology in Baguio, Philippines. He is studying applications of microcomputers in the field of theological education for developing countries.

ever become available.

Character Descriptions

The characters are formed from a 5×7 matrix on the liquid-crystal screen, and include full upper- and lowercase ASCII, with descenders. (Although the descenders don't actually extend below the line, they look natural.)

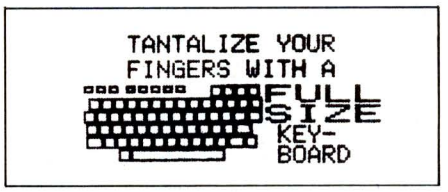
A four-position DIP switch that can be reached through a snap-off cover on the bottom of the unit allows the HX-20 to display any of eight international character sets. The readability of the LCD (liquid-crystal display) is enhanced by a "view-angle" control on the right side of the Epson. It can be adjusted to provide a clear screen with good contrast in every lighting condition I have had it in so far.

A set of graphics characters is available by hitting the right keys while holding down the GRPH key, which serves as a second shift key. One catch is that the graphics symbols aren't marked on the keys, and unless you refer to the manual, you have to find them by trial and error.

Graphics symbols include all the basic angles and line segments necessary for drawing Pac-Man-style mazes, plus symbols for the suits in a deck of cards, a musical note and practically any other simple figure you wish to display.

When the Epson is powered up, the keyboard normally produces capital letters; it produces lowercase letters when shifted (shades of the old TRS-80 word processing gymnastics!). Fortunately, hitting the Caps Lock key reverses the situation; this mode would be used in word processing.

Another keyboard goodie is the NUM key, which shifts the keyboard into a numbers-only mode. In this mode, the numbers 7, 8 and 9 on the top row of the keyboard form the top three numbers of a numeric keypad. The letters U, I, O, J, K, L and M serve as the keys for 4, 5, 6, 1, 2, 3 and 0, respectively. While in NUM mode, the hitting of most other keys (the arithmetic operator keys are exceptions) results in no input. Mistakes, while not impossible, are greatly reduced as a result. The numerical equivalent is indicated on the appropriate key.



The editing keys on the Epson are a snap to use, and they make the Epson and Microsoft Basic about the most easily-edited Basic on the market. Arrow keys move the cursor not just around the 20×4 screen, but all over the virtual screen, which you can define up to 255 characters by 255 lines. The bigger the virtual screen, though, the less RAM you have left, so it is best to work with as small a screen as practical.

The arrow keys, together with the INS and DEL (insert and delete) keys, make the editing of Basic statements simple. Just position the cursor over the offen-ing part and retype, using the INS and DEL keys as necessary. Even line numbers can be changed this way!

The HX-20 includes some screen-manipulating keys for getting around the virtual screen quickly, and a mass of unmemorizable control keys for performing terminal functions. For instance, control-I performs a horizontal tab, and control-E deletes the characters between the cursor and the next carriage return. These control keys should prove most useful when used in word processing programs.

Pint-sized Printer

Epson is famous for printers, so a printerless Epson computer is unthinkable. The one built into the top left side of the HX-20 is handy for printing numerical results; in fact, it uses what looks like standard adding-machine tape on a one-inch roll. It is capable of printing all of the HX-20 characters, including the graphics, in a clear blue 24-column dot matrix.

A Capsule Look At Epson's HX-20

Uses
Personal computing, business, professional.

Manufacturer
Epson America, Inc., 3415 Kashiwa St., Torrance, CA 90505 (213-539-9140).

Base List Price
$795.

Standard Features
Briefcase-size body; CMOS eight-bit 6301 microprocessor; 16K RAM (optionally expandable to 32K); 32K ROM (optionally expandable to 64K); RS-232C and serial interfaces; scrollable LCD screen displaying a window of four lines by 20 characters—part of a 255-character virtual screen; full-size ASCII keyboard with 68 keys, including five function keys, 13 special keys and 32 special graphic characters; and a sound generator. Built-in peripherals include a 24-column dot matrix printer with bit-addressable graphics and upper- and lowercase letters, and a time and calendar clock, with alarm.

Proportions
Three pounds, 13 ounces; 11.375×8.5×1.75 inches.

Software
MicroSoft Basic

Documentation
Operations Manual; The HX-20 Basic Tutorial and Reference Manual.

The Epson HX-20 comes with 16K RAM (expandable to 32K) and 32K ROM (expandable to 64K). It also features RS-232C and serial interfaces, a full-size ASCII keyboard and a built-in printer.

On the negative side, it's loud—and fairly slow, to boot. The ribbon cartridge is easy to load, but it's so small that it's doubtful it will last for many mini-rolls of paper. The ribbon cartridges look like those used in the microprinter associated with Radio Shack and Sharp portables, but they are *not* the same.

A straightforward cassette interface is built into the HX-20 and connects to a standard cassette recorder via three jacks on the right side. In addition, Epson markets a microcassette recorder that mounts into the top right side of the computer.

Other standard features of the computer include a hardware clock that gives time and date information (via the TIME$ and DATE$ variables) and a tone generator that can produce four octaves of fairly quiet tones through the built-in speaker. Also provided is an RS-232C serial port that can be configured to interface with practically any computer, modem or printer. Although a bar-code reader interface is provided, neither a bar-code reader nor the software needed to operate one is presently available.

Always "On"

One odd thing about the HX-20 is that it is never exactly "off." The on/off switch on the side simply cuts off all the external parts of the computer, such as the screen, speaker, keyboard and RS-232C interface. Power is "on" at all times inside. This makes it possible to program the HX-20 to turn itself on at a preprogrammed time, run a program and turn itself "off" when done!

Since the HX-20 is never really off, it's not clear how welcome it might be on an airplane. According to one technician I spoke to at Epson, though, it has been used extensively in private planes and charters with no interference with radios or instruments. (On the other hand, if your Boeing 747 begins to loop and roll, be safe—ditch your HX-20!)

The built-in sound generator uses a piezo-electric speaker and produces 56 notes in a four-octave range, beginning at middle C. Unlike some computers, the HX-20 does not have to suspend other program activities to produce sound and musical effects. The sounds produced are not at all loud, however.

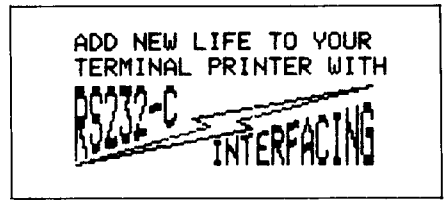
There are two DIN (Deutsch Industrial Norm) plugs on the back of the HX-20. While these are still not common, they are appearing in everything from video-cassette recorders to computers.

Both are serial ports, but one is designated primarily as a high-speed serial link between the HX-20 and the video interface. The other is a general-purpose serial port using RS-232 signal levels.

With the aid of a variety of adapter cords from Epson, the HX-20 can be interfaced with anything that uses RS-232 serial format: modems, printers or other computers. The HX-20 can be programmed (using the Basic open command) to configure its RS-232 port to any combination of baud rates, word lengths (seven or eight bits), stop bits (one or two), parity and handshaking.

Two Beeps and a Scroll

One of the ads for the HX-20 burbles about it being the first "user-



friendly" computer. Just turning it on gives you a lesson in user-friendliness. It gives a double beep, and proceeds to scroll a menu up the screen. The first items listed give you the opportunity to initialize the built-in clock and calendar, or to diddle with the registers in the CPU by means of the monitor, or to run Basic.

Furthermore, you can have up to five Basic programs loaded in separate "operating areas," and if you title one of these, it will appear in the menu as well.

If you titled a program "Interest" (using the Basic "Title" command), all that is necessary to run it would be to push the number indicated in the menu. If any special-application ROMs are installed (Epson has hinted that they will be), they too will appear in the menu.

Basic-Hopping

A special-purpose key called LogIn enables you to hop from one of the five Basic operating areas to another, and the PCopy command will copy a program from one program area to another. Naturally, with only 16K of RAM to play around with, you cannot have five hefty programs in RAM and expect to have much working area. Interestingly enough, a Basic program can jump to one in another work area and continue on.

Probably the most delightful surprise of all is the fabulously complete version of Microsoft Basic that comes in the HX-20 ROMs. It supports a virtually "standard" Microsoft Basic, complete with every conceivable string function, and even get and put commands for use with random files maintained in RAM.

The LCD display is fully controllable on a dot-by-dot basis through the commands PSet (turn on dot), Preset (erase dot) and Point (check dot). The sound generator is controlled through the sound command. There is even a color command, which will support an upcoming video controller.

Calls to machine routines can be made in Basic with the USR command, and the wind command will advance or rewind the optional microcassette to a specific tape-counter position. Yet another command (TAPCNT) will read the present position of the tape counter.

The HX-20's five special function keys can be reprogrammed in Basic to do just about anything. Since the same keys, when shifted, yield another five options, a total of ten programmable functions can be worked into user programs to make them even more "user-friendly."

Stocked with Stamina

Since the HX-20's strong suit is portability, it must be able to run without dependence on the power company. The HX-20 will run for up to 50 hours without needing a recharge of the built-in battery pack. This means it can handle three hours of use per day for more than two weeks without being recharged.

The HX-20 monitors the charge level of the built-in nickel-cadmium battery pack. When the charge level is perilously low, the computer prints a reminder on the screen to recharge the batteries—and then turns off. This ensures that everything in memory will be retained even if it is several weeks until it can be recharged.

Recharging requires eight hours—and the operations manual warns of the poxes on whoever might dare to operate the HX-20 while it is recharging. Actually, operating the HX-20 while it's recharging isn't harmful; it just takes longer to get a full charge. The big danger is that the charger could be left on for more than the time required, resulting in overheating and damage to the computer. Even when off, all memory is retained through a

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negligible consumption of power.

The heart of the HX-20 is a Hitachi-made microprocessor, the 6301. This is the equivalent of a 6801 microprocessor, except that it uses CMOS (complementary metal-oxide semiconductor) technology for low-power consumption. As a result, it should prove easy to write assembly-language programs for the HX-20 on other computers using a 6801 cross-assembler.

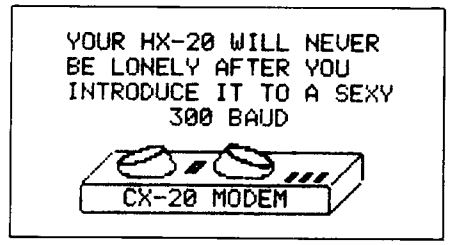
In reality, the HX-20 uses two 6301s. The primary 6301 manages the built-in 32K ROM and 16K RAM, as well as the keyboard and display. The slave 6301 controls the microprinter, the sound generator and the cassette interface. Both run at a clock rate of 614 kHz, which seems painfully slow for those of us used to Z-80As running at 4 MHz.

Since all of the HX-20's chips are CMOS, it requires *very* low power, but CMOS is also the slowest variety of semiconductor there is. Another bottleneck to speed is the LCD display. One short program ran in 72 seconds, but when the print lines were deleted, it ran in six seconds.

The slowness also can be noticeable when typing at fast touch-typing speeds. With the screen set to a virtual width of 80 characters, the cursor moves across the window for the first 20 characters. After that point, the cursor stays at the far right side, but the whole window appears to move to the right as more letters are entered. This has the effect of rewriting the entire screen with every keystroke. The HX-20 has an eight-character keyboard buffer, but a fast typist can still miss a few letters at carriage returns.

What about documentation? Everything provided with the HX-20 is a model of clarity. The operations manual is a gem—every important concept is illustrated with a picture. It is almost totally free from jargon, yet is not insultingly elementary or, even worse, cute.

On the other hand, the early units sold included nothing more than the operations manual! The *HX-20 Basic Tutorial and Reference Manual* was still in production at the time of writing this article, and all of the Basic capabilities had to be pieced together from nothing more than a list of commands and reserved words.



Software on the Way?

The usefulness of the HX-20 depends to a great degree on the availability of software to take advantage of its considerable power. Epson has hinted of software packages for word processing and telecommunications that would be available in a variety of formats, including ROM. (There *is* room for one 8K ROM inside a hatch on the bottom of the HX-20.)

In the near future, an expansion interface will be available; it adds about three inches to the left side of the HX-20, but it provides 16K more RAM and allows several 16K ROMs to be bank-switched with the Basic ROMs in the HX-20.

If the user wants to forego the optional microcassette, other ROM packs can be fitted into that place in the top right-hand side of the HX-20. These ROM packs don't actually become part of the system memory, but are down-loaded into system RAM. In effect, they simulate a fast tape unit that can be read from, but not written to.

The first software packages in the works include a word processing program and an electronic spreadsheet program. The HX-20's real capabilities as a lap-sized word processor will have to be evaluated when some professionally-written software is available.

The HX-20 was designed with expansion in mind. In addition to the expansion interface, a video controller and floppy disk system are planned. The video controller is rumored to be an HX-20-sized unit that will serve as a base for the HX-20. It will display 16 rows of 32 columns, including color graphics (64 × 120 pixels), on either a standard TV set or a video monitor. It connects to the HX-20 by means of the serial port that operates at 32,000 baud. A dual floppy disk system will daisy-chain to the HX-20 through the same port. This system uses a pair of Epson disks, each only one inch wide, mounted vertically. Each drive will have a capacity of 328K, for a total of 656K per pair.

A disk controller for the HX-20 is also planned. The same DIP switch used for selecting the international character sets has a setting that causes the HX-20 to select Disk Basic instead of the internal ROM Basic. A video interface, acoustic coupler and compact printer are also in the works.

The User's Buddy: Epson HX-20

For true portability and complete freedom from Reddy Kilowatt, the Epson is in a class by itself. If you've ever dreamed of using a portable computer to redeem dead time (by writing letters or articles, programming, or just having fun), this computer will do it all.

While it obviously isn't intended to be the serious user's only computer, especially for word processing, it's in a class by itself as a portable data-entry terminal. And as the rest of the Epson HX-20 family of accessories becomes available, it may prove itself the only system needed, even for a dedicated computerholic. ■

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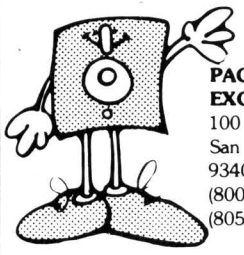

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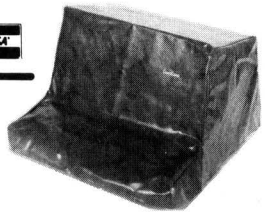

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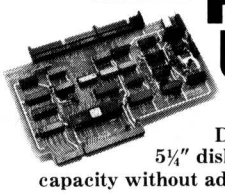

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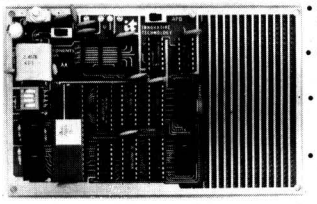

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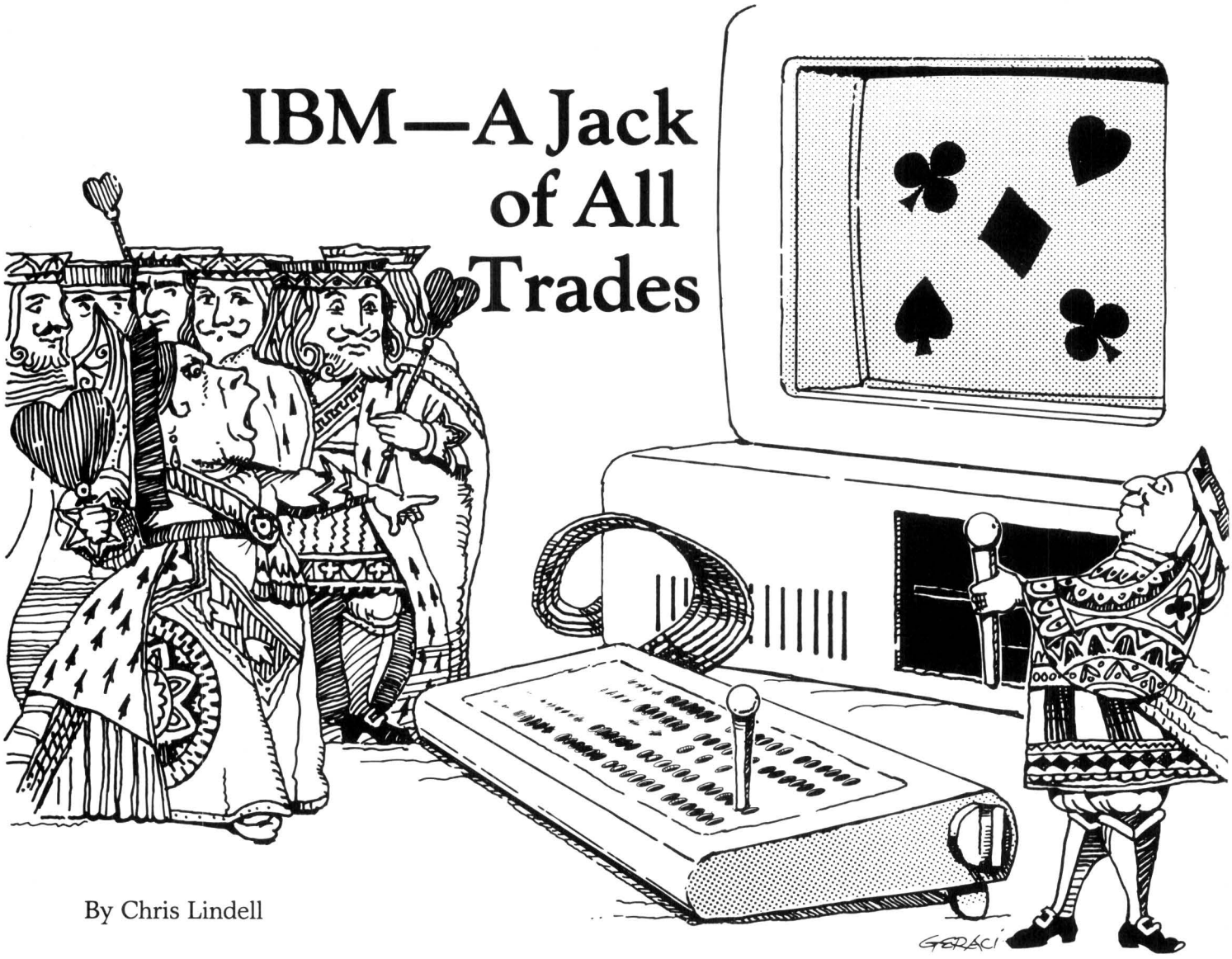

By Chris Lindell

If you're wondering what's in the cards for IBM PC applications, the answer may lie in cribbage.

Cribbage is designed to work on the IBM PC with 64K, BasicA and either a monochrome or color graphics display. The original logic for playing the cards and counting points was developed for an IBM model 5110 and appeared in a 1979 issue of *Creative Computing*. This new version allows the player to view his cards at all times, in addition to being able to view the opponent's cards as they are played.

Cribbage Rules

Before getting into a description of the cribbage program, a few words need to be said about the game and its rules. This version is referred to as two-hand cribbage. The deck consists of 52 cards with kings high and aces low.

To determine who deals first, the deck is cut; the player with the lowest card deals. If both players draw cards of the same rank, they must draw again. Each player receives six cards, dealt one at a time. Players deal alternately during the game.

After the deal, each player looks at his cards and discards two, reducing each player's hand to four. The four discards are called the "crib" and belong to the dealer, but they're not exposed until after the play.

After discarding, an "up card" is generated. Usually this is done by the nondealer cutting the deck and the dealer turning up the top card of the lower packet and placing the card face-up on top of the pack.

In this version of cribbage, the up-card is randomly generated after both players have discarded. If the up-card is a jack, the dealer scores two points. The up-card is not used in the play.

Play begins with the nondealer laying one of four cards face-up on the table. The dealer similarly exposes a card, the nondealer does the same and so on. The hands are exposed card by card, alternately, except for "go's."

During play, the running total of cards may never be carried beyond 31. If a player is unable to add another card without exceeding 31, he says "go" and his opponent scores one point.

The player gaining the go must first lay down any additional cards that can be played without exceeding 31. Besides the point for the go, the player is entitled to any additional points that can be made through pairs and runs. If the player reaches exactly 31, two points are scored instead of one.

The player who called "go" must lead for the next series of play, with the count starting at zero. The lead

Address correspondence to Chris Lindell, PO Box 5360, Coralville, IA 52241.

may not be combined with any cards previously played in an attempt to form a scoring combination (the go having interrupted the sequence).

The object is to score points by playing cards that consist of the following combinations:

- 15—Two points for adding a card that makes the total 15.
- Pair—Two points for adding a card of the same rank as the last card played. (Note that face cards pair only by actual rank—jack with jack, but not jack with queen.)
- Triplet—Six points for adding the third card of the same rank.
- Four—Twelve points for adding the fourth card of the same rank.
- Run (sequence)—For adding a card that forms a sequence of three or more, score one point for each card in the sequence. (Runs are independent of suits, but go strictly by rank; for example 9-10-J is a run, but 9-10-Q is not.)

Order is Important

When play ends, the three hands are counted in this order: nondealer, dealer's hand, crib. The order is important, because toward the end of the game, the nondealer may "count out" and win before the dealer has a chance to count, even though the dealer's total would have exceeded that of his opponent. The up-card is considered to be a part of each hand, so all hands in counting consist of five cards.

The basic formations of scoring value follow:

- 15—Each combination of cards that totals 15 scores two points.
- Pair—Each pair of cards of the same rank scores two points.
- Run—Each combination of three or more cards in sequence scores one point for each card in the sequence.
- Flush—Four cards of the same suit in hand (not crib, and not including the up-card) scores four points. Four cards in hand or crib of the same suit as the up-card scores five points.
- Nobs—Jack of the same suit as the up-card scores one point.

"Combination" is used in a strict technical sense. Each and every combination of two cards that make a pair, of two or more cards that make 15, or of three or more cards that make a run count separately. For example, a hand (including the up-card) of 8-7-7-6-2 scores eight points for four combinations that total 15—the 8 with one 7 or with the other, or the 6-2 with one 7 or with the other. It scores two points for a pair and six for two runs of three 8-7-6 hands, using each seven in turn.

Program listing. This program allows you to play cribbage with your IBM PC.

```
10 REM ================================
20 REM * * * * * * * * * * * * * * * *
30 REM    CRIBBAGE for the IBM PC
40 REM by Chris Lindell, L.C.Systems
50 REM        P.O.Box 5360
60 REM     Coralville, IA  52241
70 REM       (319) 354-2630
80 REM * * * * * * * * * * * * * * * *
90 REM ================================
100 CLS:KEY OFF:LOCATE 12,25:PRINT"  C R I B B A G E ":LOCATE 14,37:PRINT "initi
alizing variables"
110 I=0:J=0:RANDOMIZE VAL(RIGHT$(TIME$,2))
120 DIM D(52,4),C$(52),I(52),W(6,4),M(6,4),Y(6,4),C(4,4),D$(6),V(15,7),Q(11,6),R
(4,5),S(4),J(52)
130 REM ======================  initialize variables  ==========================

140 FOR N= 1 TO 15:FOR M= 1 TO 7:READ V(N,M):NEXT M:NEXT N
150 FOR N = 1 TO 11:FOR M = 1 TO 6:READ Q(N,M):NEXT M:NEXT N
160 FOR N = 1 TO 4:FOR M = 1 TO 5:READ R(N,M):NEXT M:NEXT N
170 FOR N = 1 TO 4:READ S(N):NEXT N
180 FOR N = 1 TO 6:READ D$(N):NEXT N
190 FOR I = 1 TO 13
200 READ C$: C$ = C$ +"  "
210 MID$(C$,3,12)=CHR$(6)
220 C$(I)=C$
230 MID$(C$,3,12)=CHR$(4)
240 C$(I+13)=C$
250 MID$(C$,3,12)=CHR$(3)
260 C$(I+26)=C$
270 MID$(C$,3,12)=CHR$(5)
280 C$(I+39)=C$
290 NEXT I
300 S1=0: S2=0
310 REM ======  shuffle the deck then cut for deal,` low card deals  ===========
320 GOSUB 5640
330 GOSUB 5800
340 REM ================  shuffle the deck and deal  ==========================
350 GOSUB 5640
360 GOSUB 6080
370 REM ========  find the best four card, discard the other two  =============
380 GOSUB 3380
390 REM ======================  discards  ====================================
400 I1=V(B9,5)
410 I2=V(B9,6)
420 LOCATE 22,1:PRINT "YOUR DISCARDS (INPUT 2 VALUES)          ";
430 LOCATE 22,31:INPUT;I3,I4
440 IF I3 < 1 GOTO 460
450 IF I3 < 7 GOTO 480
460 LOCATE 24,1:PRINT "now really";:BEEP
470 GOTO 420
480 IF INT(I3)<>I3 GOTO 460
490 IF I4=I3 GOTO 460
500 IF I4<1 GOTO 460
510 IF I4>6 GOTO 460
520 IF I4 <>INT(I4) GOTO 460
530 PST=((I3-1)*10)+13:LIN=4:LOCATE 3,PST-2:PRINT "  ":GOSUB 6480
540 PST=((I4-1)*10)+13:LIN=4:LOCATE 3,PST-2:PRINT "  ":GOSUB 6480
550 REM ========================  crib  ====================================
560 FOR J = 1 TO 4
570 C(1,J)=M(I1,J)
580 C(2,J)=M(I2,J)
590 C(3,J)=Y(I3,J)
```

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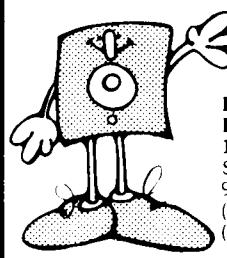

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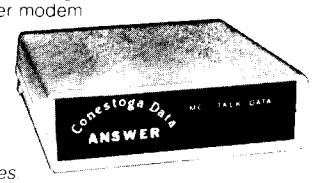

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Listing continued.

```
600 C(4,J)=Y(I4,J)
610 NEXT J
620 REM ====================  generate the upcard  ============================
630 GOSUB 4180
640 REM ========================  play the hand  ==============================
650 GOSUB 1470
660 REM ====================== count up the points ============================
670 LOCATE 23,1:PRINT SPC(39):IF M = 0 GOTO 710
680 LOCATE 23,2:PRINT "You score first ";
690 X1=1
700 GOTO 930
710 LOCATE 23,2:PRINT "I score first  ";
720 X1 = 2
730 GOTO 1200
740 LOCATE 13,28:PRINT " - - THE CRIB CONTAINS - - "
750 FOR I = 1 TO 4
760 PST = ((I-1)*10)+13:LIN = 16:CARD$=C$(C(I,1)):GOSUB 6320
770 NEXT I
780 FOR I = 1 TO 4
790 FOR J = 1 TO 4
800 W(I,J)=C(I,J)
810 NEXT J
820 NEXT I
830 C=1
840 W(5,4)=T9
850 GOSUB 4390
860 ON X1 GOTO 870,910
870 S1=S1+P
880 LOCATE 23,1:PRINT SPC(39):LOCATE 23,2:PRINT "The crib has ";P;" points":LOCA
TE 21,37:PRINT USING"###";S1
890 IF S1>=121 GOTO 1400
900 GOTO 1370
910 X1=3
920 GOTO 1050
930 K=1
940 FOR I = 1 TO 6
950 IF I = I3 GOTO 1010
960 IF I = I4 GOTO 1010
970 FOR J = 1 TO 4
980 W(K,J)=Y(I,J)
990 NEXT J
1000 K = K + 1
1010 NEXT I
1020 W(5,4)=T9
1030 C = 0
1040 GOSUB 4390
1050 LOCATE 23,1:PRINT SPC(39):LOCATE 23,2:PRINT "How many points do you have";
1060 INPUT P9
1070 D = P-P9
1080 IF D >= 0 GOTO 1110
1090 LOCATE 24,1:PRINT " Not with that hand - try again ";:BEEP
1100 GOTO 1050
1110 S2 = S2+P9
1120 LOCATE 21,18:PRINT USING "###";S2:LOCATE 21,37:PRINT USING "###";S1
1130 IF S2 = 121 GOTO 1430
1140 IF D = 0 GOTO 1190
1150 S1=S1+D
1160 LOCATE 21,18:PRINT USING "###";S2:LOCATE 21,37:PRINT USING "###";S1
1170 LOCATE 24,1:PRINT SPC(39):LOCATE 24,1:PRINT " Muggins for ";D;" points";
1180 IF S1>= 121 GOTO 1400
1190 ON X1 GOTO 1200,740,1370
1200 FOR K = 1 TO 4
1210 L=V(B9,K)
1220 FOR J = 1 TO 4
1230 W(K,J)=M(L,J)
1240 NEXT J
1250 NEXT K
1260 FOR K = 1 TO 4
1270 L = W(K,1)
1280 NEXT K
1290 W(5,4)=T9
1300 C = 0
1310 GOSUB 4390
1320 S1=S1+P
1330 IF S1>=121 GOTO 1400
1340 LOCATE 23,1:PRINT SPC(39):LOCATE 23,2:PRINT "I have ";P;" points";
1350 LOCATE 21,18:PRINT USING "###";S2:LOCATE 21,37:PRINT USING "###";S1
1360 ON X1 GOTO 740,930
1370 LOCATE 21,18:PRINT USING "###";S2:LOCATE 21,37:PRINT USING "###";S1
1380 GOTO 340
1390 REM ========================== end of the game ============================
1400 CLS
1410 LOCATE 12,30:PRINT "I win ";S1;" to ";S2
1420 END
1430 CLS
1440 LOCATE 12,30: PRINT "You win ";S2;" to ";S1
1450 END
1460 REM ========================
1470 REM     PLAY OF THE HAND
1480 REM ========================
1490 Y5=0:M5=0:C=0:S9=0:G=0
1500 IF M = 0 GOTO 1910
1510 IF Y5<>4 GOTO 1540
1520 IF M5= 4 GOTO 2470
1530 GOTO 1910
1540 LOCATE 20,1:PRINT SPC(39)::LOCATE 20,2:PRINT "Your play, what card number";
1550 INPUT C$
1560 IF C$="go" OR C$ = "GO" GOTO 1910
1570 FOR C6= 1 TO 6
1580 IF C$=D$(C6) GOTO 1620
1590 NEXT C6
1600 BEEP:LOCATE 24,2:PRINT "invalid play";
```

More →

The total is 16.

Certain basic formulations should be learned to facilitate counting. For pairs and runs alone, a triplet counts six points, four of a kind counts 12, a run of three, with one card duplicated (double run) counts eight, a run of four, with one card duplicated, counts ten, a run of three, with one card triplicated (triple run), counts 15 and a run of three, with two different cards duplicated, counts 16.

Should a player overlook any points, the opponent may score the points that were overlooked; these points are referred to as "Muggins."

Play ends the moment either player reaches 121 points, whether by scoring points during the play or when counting cards. If the nondealer "goes out" by count of his hand, the dealer may not count either his hand or the crib.

Simple Program Description

The program listing contains sufficient remarks to understand the flow of the program once the original card game is known.

Variable D is a two-dimensional array that contains the cards (including the absolute card number), suits of the cards and values of the cards. Array C$ contains the description of the card deck, which is used for displaying the cards on the display screen. The computer's hand is contained in matrix M and the player's hand is kept in matrix Y. The four discards (the crib) are kept in matrix C.

The player is given a sufficient amount of time to decide what to discard. While the message "Please wait . . . I'm looking at my cards" appears in the lower left-hand corner of the display, the computer is checking every possible four-card combination of its six cards to determine which four cards would yield the most points. This is the only bottleneck in the program; I haven't found a way around it. The computer checks for sums of 15, a flush, pairs, three or four of a kind and three- or four-card runs.

After discarding, the pace of play is determined by the player. The messages are displayed in the lower left-hand corner of the screen. Besides prompts such as "Your play, what card number?" both players' scores are displayed, along with the sum of the cards and whatever points may be scored with the play of a card.

As you can see, the program is quite lengthy. I'll provide copies on disk for $7.■

Listing continued.

```
1610 GOTO 1540
1620 IF C6= I3 GOTO 1850
1630 IF C6=I4 GOTO 1850

1640 IF Y5 = 0 GOTO 1680
1650 FOR J = 1 TO Y5
1660 IF I(10+J)=C6 GOTO 1870
1670 NEXT J
1680 IF S9+Y(C6,2)>31 GOTO 1890
1690 S9=S9+Y(C6,2)
1700 Y5=Y5+1
1710 I(10+Y5)=C6
1720 C=C+1
1730 J(C)=Y(C6,4)
1740 GOSUB 2920
1750 PST = ((C6-1)*10)+13:LIN =4:LOCATE 3,PST-2:PRINT "X ";
1760 GOSUB 6370
1770 LOCATE 22,19:PRINT USING "##";S9:LOCATE 22,37:PRINT USING "###";P
1780 F = 1
1790 S2= S2+P
1800 LOCATE 21,18:PRINT USING "###";S2:LOCATE 21,37:PRINT USING "###";S1
1810 IF S2 >=121 GOTO 1430
1820 IF S9 <> 31 GOTO 1910
1830 F=0:C=0:S9=0:G=0
1840 GOTO 1910
1850 LOCATE 24,1:PRINT "you discarded that card, try again ";:BEEP
1860 GOTO 1540
1870 LOCATE 24,1:PRINT "already played - try again ";:BEEP
1880 GOTO 1540
1890 LOCATE 24,1:PRINT "that totals more than 31, try again ";:BEEP
1900 GOTO 1540
1910 IF M5<> 4 GOTO 2050
1920 IF Y5 = 4 GOTO 2470
1930 IF C$ <> "go" AND C$ <> "GO" GOTO 1510
1940 IF F=2 GOTO 2000
1950 LOCATE 23,2:PRINT "You get 1 point for last card";
1960 S2=S2+1:GOSUB 6370
1970 IF S2>= 121 GOTO 1430
1980 F= 0:C = 0: S9 =0
1990 GOTO 1510
2000 LOCATE 23,2:PRINT "I get 1 point for last card ";
2010 S1=S1+1:GOSUB 6370
2020 IF S1>= 121 GOTO 1400
2030 F = 0:C = 0:S9=0
2040 GOTO 1510
2050 K9=0: P9=0
2060 C9=C
2070 C=C+1
2080 H9=S9
2090 FOR I9=1 TO 6
2100 I(I9)=0
2110 IF I9=I1 GOTO 2250
2120 IF I9=I2 GOTO 2250
2130 IF M5=0 GOTO 2170
2140 FOR J9=1 TO M5
2150 IF I9=I(20+J9) GOTO 2250
2160 NEXT J9
2170 IF H9+M(I9,2)>31 GOTO 2250
2180 K9=K9+1
2190 S9=H9+M(I9,2)

2200 J(C) = M(I9,4)
2210 GOSUB 2920
2220 IF P > P9 THEN P9  = P
2230 I(I9)=P
2240 I(K9+30)=I9
2250 NEXT I9
2260 C=C9
2270 S9=H9
2280 IF K9<> 0 GOTO 2570
2290 IF C$<> "go" AND C$ <>"GO" GOTO 2360
2300 IF G = 1 GOTO 2370
2310 LOCATE 23,2:PRINT"I get 1 point for last card ";
2320 C= 0:S9=0
2330 S1=S1+1:GOSUB 6370
2340 IF S1>= 121 GOTO 1400
2350 GOTO 1510
2360 IF Y5 <> 4 GOTO 2430
2370 LOCATE 23,2:PRINT "I'll give you 1 point for last card ";
2380 S2=S2+1:GOSUB 6370
2390 IF S2>= 121 GOTO 1430
2400 C=0:S9=0:G =0
2410 C$ =""
2420 GOTO 1910
2430 IF G=1 GOTO 1510
2440 LOCATE 24,1:PRINT SPC(39):LOCATE 24,18:PRINT "GO";
2450 G=1
2460 GOTO 1510
2470 IF F= 0 GOTO 2560
2480 IF F=1 GOTO 2530
2490 LOCATE 23,1:PRINT "I get 1 point for last card ";
2500 S1=S1+1:GOSUB 6370
2510 IF S1>= 121 GOTO 1400
2520 GOTO 2560
2530 LOCATE 23,2: PRINT "You get 1 point for last card ";
2540 S2=S2+1:GOSUB 6370
2550 IF S2>=121 GOTO 1430
2560 RETURN
2570 C = C+1
2580 M5=M5+1
2590 IF C<> 1 GOTO 2740
2600 FOR J9 = 1 TO 4
2610 I9=V(B9,J9)
2620 FOR VV% = 1 TO M5-1
```

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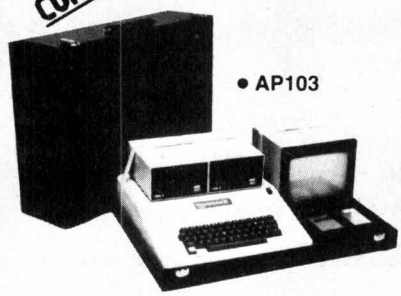

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```
2630 IF I(VV%+20) = I9 GOTO 2710 ELSE NEXT VV%
2640 REM ======================  don't play a 5 first  ======================
2650 IF M(I9,2)=5 GOTO 2710
2660 I(M5+20)=I9
2670 J(C)=M(I9,4)
2680 P9=0
2690 S9=M(I9,2)
2700 GOTO 2810
2710 NEXT J9
2720 L=V(B9,1)
2730 GOTO 2660
2740 FOR J9=1 TO K9
2750 I9=I(J9+30)
2760 IF I(I9)=P9 GOTO 2780
2770 NEXT J9
2780 I(M5+20)=I9
2790 J(C)=M(I9,4)
2800 S9=S9+M(I9,2)
2810 LOCATE 7,30:PRINT "- -  MY CARDS ARE  - -";
2820 PST = ((I9-1)*10)+13:LIN = 10:LOCATE 10,PST-2:CARD$=C$(M(I9,1)):GOSUB 6320:
IF Q$ <> "s" THEN GOSUB 6370
2830 F=2
2840 S1=S1+P9
2850 LOCATE 21,18:PRINT USING "###";S2:LOCATE 21,37:PRINT USING "###";S1
2860 IF S1>=121 GOTO 1400
2870 IF S9<> 31 GOTO 2900
2880 F=0:C=0:S9=0
2890 GOTO 1510
2900 IF C$="go" OR C$= "GO" GOTO 1910
2910 GOTO 1510
2920 REM ==========================
2930 REM check for 15,OR 31 OR
2940 REM  2,3,4 OF A KIND AND RUNS
2950 REM ==========================
2960 P=0
2970 IF C =1 GOTO 3200
2980 IF S9<> 15 GOTO 3010
2990 P = P+2
3000 GOTO 3030
3010 IF S9<> 31 GOTO 3030
3020 P = P+2
3030 IF C-2 > 2 THEN MAX = C-2 ELSE MAX = 2
3040 FOR I = C TO MAX STEP -1
3050 IF J(I)<> J(I-1) GOTO 3130
3060 ON C-I+1 GOTO 3070,3090,3110
3070 P = P+2
3080 GOTO 3120
3090 P = P+4
3100 GOTO 3120
3110 P = P+6
3120 NEXT I
3130 REM  ==========================  runs  ==============================
3140 IF C=2 GOTO 3200
3150 R9=0
3160 FOR I = 3 TO C
3170 GOSUB 3210
3180 NEXT I
3190 P = P+ R9
3200 RETURN
3210 FOR J = 1 TO C
3220 J(J+10)=J(C-J+1)
3230 NEXT J
3240 FOR K = 1 TO I
3250 FOR L = K+1 TO I
3260 IF J(K+10)<J(L+10) GOTO 3300
3270 X = J(K+10)
3280 J(K+10)=J(L+10)
3290 J(L+10)=X
3300 NEXT L
3310 NEXT K
3320 FOR K = 1 TO I-1
3330 IF J(K+10)<> J(K+11)-1 GOTO 3360
3340 NEXT K
3350 R9= I
3360 RETURN
3370 REM ================================
3380 REM   FIND THE BEST FOUR CARD HAND
3390 REM ================================
3400 P9=0
3410  FOR Z9=1 TO 15
3420 I1=V(Z9,1)
3430 I2=V(Z9,2)
3440 I3=V(Z9,3)
3450 I4=V(Z9,4)
3460 FOR J = 1 TO 4
3470 W(1,J)=M(I1,J)
3480 W(2,J)=M(I2,J)
3490 W(3,J)=M(I3,J)
3500 W(4,J)=M(I4,J)
3510 W(5,J)= 25
3520 NEXT J
3530 REM ======================  evaluate the hand  ==========================
3540 C= 0
3550 GOSUB 4390
3560 V(Z9,7)=P
3570 IF P > P9 THEN P9 = P
3580 NEXT Z9
3590 REM =============  find all hands with max score (p9)  ==================
3600 J = 0
3610 FOR I = 1 TO 15
3620 IF V(I,7)<> P9 GOTO 3650
3630 J = J +1
3640 I(J)=I
```

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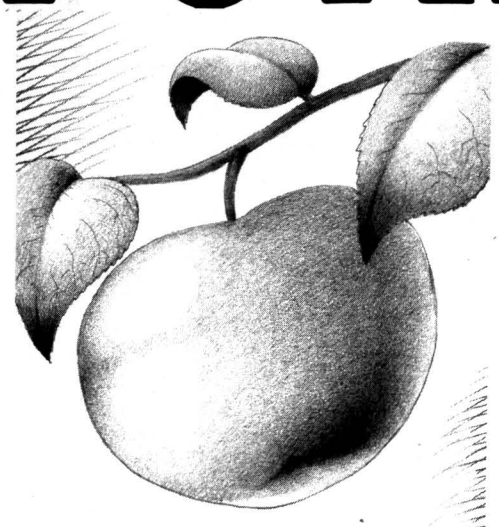

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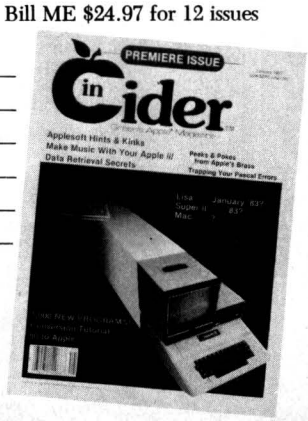

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```
3650 NEXT I
3660 IF J > 1 GOTO 3700
3670 REM ================== this is the single best hand  ==================
3680 B9=I(1)
3690 RETURN
3700 REM ============  no single best hand search for key cards  ============
3710 REM ======================  check for fives  ============================
3720 C9=5
3730 Z=1
3740 GOTO 3950
3750 REM ======================  check for eights  ===========================
3760 C9=8
3770 Z=2
3780 GOTO 3950
3790 REM ======================  check for sevens  ===========================
3800 C9=7
3810 Z=3
3820 GOTO 3950
3830 REM ======================  check for jacks  ============================
3840 C9=11
3850 Z=4
3860 GOTO 3950
3870 REM ======================  check for aces  =============================
3880 C9=1
3890 Z=5
3900 GOTO 3950
3910 REM ========  randomly chose a best hand if we reach this point  =========
3920 B9=INT(J*RND)+1
3930 B9=I(B9)
3940 RETURN
3950 REM =========  best hand will be whichever has most of card  C9  =========
3960 P9=0
3970 FOR I = 1 TO 15
3980 J(I)=0
3990 NEXT I
4000 FOR I = 1 TO J
4010 FOR K = 1 TO 4
4020 L=V(I(I),K)
4030 IF M(L,4)<> C9 GOTO 4050
4040 J(I)=J(I) +1
4050 NEXT K
4060 IF J(I)>P9 THEN P9 = J(I)
4070 NEXT I
4080 K = 0
4090 FOR I = 1 TO J
4100 IF J(I)<> P9 GOTO 4130
4110 K = K +1
4120 B9=I(I)
4130 NEXT I
4140 IF K<> 1 GOTO 4160
4150 RETURN
4160 ON Z GOTO 3760,3800,3840,3880,3920
4170 REM ========================
4180 REM   GENERATE THE UPCARD
4190 REM ========================
4200 U=INT(RND*38)+14
4210 PRINT
4220 LIN=21:PST=63:CARD$=C$(D(U,1)):LOCATE LIN,47:PRINT "THE UPCARD IS....":GOSU
B 6320
4230 PRINT
4240 FOR I = 1 TO 4.
4250 W(5,I)=D(U,I)
4260 NEXT I
4270 T9=W(5,4)
4280 IF W(5,4)<> 11 GOTO 4370
4290 IF M=0 GOTO 4340
4300 PRINT "two points to me"
4310 S1=S1+2
4320 IF S1>=121 GOTO 1400
4330 RETURN
4340 PRINT "two points to you "
4350 S2=S2+2
4360 IF S2>=121 GOTO 1430
4370 RETURN
4380 REM ============================
4390 REM   SCORE THE FIVE CARD HAND
4400 REM ============================
4410 REM =====  check for a jack of the same suit as up card except crib  =====
4420 P =0
4430 IF C=1 GOTO 4500
4440 FOR I = 1 TO 5
4450 IF W(I,4)<> 11 GOTO 4490
4460 IF W(I,3)<> W(5,3) GOTO 4490
4470 P = P+1
4480 GOTO 4500
4490 NEXT I
4500 REM ==================  check for a 4 or 5 card flush  ==================
4510 FOR I = 1 TO 3
4520 IF W(I,3)<> W(I+1,3) GOTO 4620
4530 NEXT I
4540 REM ================  crib scores only for a 5 card flush  ==============
4550 IF C<> 0 GOTO 4600
4560 P = P+4
4570 IF W(4,3)<> W(5,3) GOTO 4620
4580 P = P+1
4590 GOTO 4620
4600 IF W(4,3)<> W(5,3) GOTO 4620
4610 P = P+5
4620 REM ====================  check for 2 card sums of 15  ==================
4630 FOR I = 1 TO 4
4640 FOR J = I+1 TO 5
4650 IF W(I,2)+W(J,2)<> 15 GOTO 4670
4660 P = P+2
```

More →

Listing continued.

```
4670 NEXT J
4680 NEXT I
4690 REM ==================== check for 3 card sums of 15 ================
4700 FOR I = 1 TO 3
4710 FOR J = I+1 TO 4
4720 FOR K = J+1 TO 5
4730 IF W(I,2)+W(J,2)+W(K,2)<> 15 GOTO 4750
4740 P = P+2
4750 NEXT K
4760 NEXT J
4770 NEXT I
4780 REM ==================== check for 4 card sums of 15 ================
4790 FOR I = 1 TO 2
4800 FOR J = I+1 TO 3
4810 FOR K = J+1 TO 4
4820 FOR L = K+1 TO 5
4830 IF (W(I,2)+W(J,2)+W(K,2)+W(L,2)) <> 15 GOTO 4850
4840 P=P+2
4850 NEXT L
4860 NEXT K
4870 NEXT J
4880 NEXT I
4890 REM ================== check for 5 card sum of 15 ==================
4900 S=0
4910 FOR I = 1 TO 5
4920 S = S+W(I,2)
4930 NEXT I
4940 IF S<> 15 GOTO 4960
4950 P = P+2
4960 REM ============ check for pairs, three and four of a kind ==========
4970 FOR I = 1 TO 13
4980 J(I)=0
4990 NEXT I
5000 FOR I = 1 TO 5
5010 J=W(I,4)
5020 J(J)=J(J)+1
5030 NEXT I
5040 FOR I = 1 TO 13
5050 ON J(I)+1 GOTO 5090,5090,5080,5070,5060
5060 P = P+6
5070 P = P+4
5080 P = P+2
5090 NEXT I
5100 REM ================ sort hand into ascending sequence ==============
5110 FOR I = 1 TO 5
5120 FOR J = I TO 5
5130 IF W(I,4)<=W(J,4) GOTO 5150
5140 SWAP W(I,4),W(J,4)
5150 NEXT J
5160 NEXT I
5170 REM ==================== check for a 5 card run ====================
5180 D=W(1,4)-Q(1,1)
5190 FOR I = 1 TO 11
5200 FOR J = 1 TO 5
5210 Q(I,J)=Q(I,J)+D
5220 NEXT J
5230 NEXT I
5240 FOR I = 1 TO 11
5250 FOR J = 1 TO 5
5260 IF W(J,4)<> Q(I,J) GOTO 5310
5270 NEXT J
5280 REM ======================== a 5 card run ========================
5290 P = P+Q(I,6)
5300 RETURN
5310 NEXT I
5320 REM ==================== check for a 4 card run ====================
5330 FOR L= 1 TO 2
5340 D=W(L,4) - R(1,1)
5350 FOR I = 1 TO 4
5360 FOR J = 1 TO 4
5370 R(I,J)=R(I,J)+D
5380 NEXT J
5390 NEXT I
5400 FOR I = 1 TO 4
5410 FOR K = 1 TO 4
5420 IF W(K+L-1,4)<> R(I,K) GOTO 5470
5430 NEXT K
5440 REM ====================== a 4 card run ======================
5450 P = P+R(I,5)
5460 RETURN
5470 NEXT I
5480 NEXT L
5490 REM ================== check for a 3 card run ==================
5500 FOR L = 1 TO 3
5510 D = W(L,4)-S(1)
5520 FOR I = 1 TO 3
5530 S(I)=S(I)+D
5540 NEXT I
5550 FOR I = 1 TO 3
5560 IF W(L+I-1,4)<> S(I) GOTO 5610
5570 NEXT I
5580 REM ==================== a three card run ====================
5590 P = P+S(4)
5600 RETURN
5610 NEXT L
5620 RETURN
5630 REM ====================
5640 REM   SHUFFLE THE DECK
5650 REM ====================
5660 FOR I = 1 TO 52
5670 I(I)=0
5680 NEXT I
5690 FOR I = 1 TO 52
5700 J=INT(RND*52) +1
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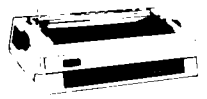

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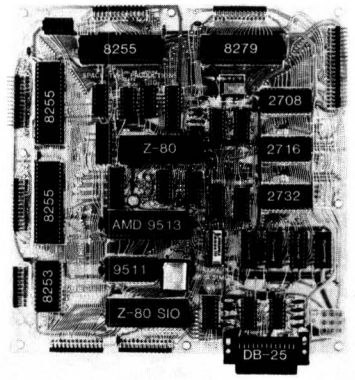

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Listing continued.

```
5710 IF I(J)<> 0 GOTO 5700
5720 D(I,1)=J
5730 D(I,3)=INT((J-1)/13)+1
5740 D(I,4)=J-13*INT((J-1)/13)
5750 IF D(I,4) < 10 THEN D(I,2) = D(I,4) ELSE D(I,2) = 10
5760 I(J)=1
5770 NEXT I
5780 RETURN
5790 REM ====================
5800 REM   CUT FOT THE DEAL
5810 REM ====================
5820 CLS:LOCATE 2,10:PRINT "  please cut for the deal (1-52)";
5830 INPUT I
5840 IF I<1 GOTO 5860
5850 IF I< 53 GOTO 5880
5860 LOCATE 4,10:PRINT "be serious now!"
5870 GOTO 5820
5880 IF I<> INT (I) GOTO 5860
5890 I1 = D(I,1)
5900 LOCATE 10,15:PRINT"YOUR CARD IS....";:PST=30:LIN=10:CARD$=C$(I1):GOSUB 6320

5910 J=INT(RND(I)*52) +1
5920 IF J = I GOTO 5910
5930  J1=D(J,1)
5940 LOCATE 16,15:PRINT"MY CARD IS......";:CARD$=C$(J1):LIN=16:PST=30:GOSUB 6320

5950 IF D(I,4)<D(J,4) GOTO 6030
5960 IF D(J,4)<D(I,4) GOTO 5990
5970 BEEP:LOCATE 4,12:PRINT"please,cut again ";
5980 GOTO 5830
5990 REM, computer deals
6000 LOCATE 16,40:PRINT CHR$(17);"- low card wins cut"
6010 M = 0
6020  RETURN
6030 REM,  player deals
6040 LOCATE 10,40:PRINT CHR$(17);"- low card wins cut"
6050 M = 1
6060 RETURN
6070 REM
6080 REM , deal
6090 REM
6100 CLS:LOCATE 22,1:PRINT "  PLEASE WAIT..I'M LOOKING AT MY CARDS ";
6110 LOCATE 20,12:IF M=0 THEN PRINT "I AM DEALING" ELSE PRINT "YOU ARE DEALING"
6120 M = 1 -M
6130 Y = 1 -M
6140 REM
6150 LOCATE 1,29:PRINT " - - YOUR CARDS ARE - - "
6160 PRINT
6170 FOR I = 1 TO 6
6180 K = 2*I-Y
6190 L = 2*I-M
6200 FOR J = 1 TO 4
6210 REM ====================  computer's hand  ============================
6220 M(I,J)=D(K,J)
6230 REM ====================  player's hand  ============================
6240 Y(I,J)=D(L,J)
6250 NEXT J
6260 PST = ((I-1)*10)+13:LIN =4:LOCATE 3,PST-2:CARD$=C$(Y(I,1)):PRINT USING "#_.
";I:GOSUB 6320
6270 NEXT I
6280 RETURN
6290 REM ====================
6300 REM     DRAW A CARD
6310 REM ====================
6320 LOCATE LIN,PST:PRINT CHR$(179);" ";LEFT$(CARD$,3);CHR$(179):LIN=LIN -1:LOCA
TE LIN,PST:PRINT CHR$(179);"     ";CHR$(179)
6330 LIN=LIN+2:LOCATE LIN,PST:PRINT CHR$(179);"     ";CHR$(179):LIN=LIN+1:LOCATE
LIN,PST:PRINT CHR$(192);STRING$(4,196);CHR$(217)
6340 LIN=LIN-4:LOCATE LIN,PST:PRINT CHR$(218);STRING$(4,196);CHR$(191);
6350 RETURN
6360 REM ====================
6370 REM,  GAME STATISTICS
6380 REM ====================
6390 LOCATE 19,1:PRINT STRING$(39,205);CHR$(187)
6400 FOR VV= 20 TO 24:LOCATE VV,40:PRINT CHR$(186);:NEXT
6410 LOCATE 21,1:PRINT USING "YOUR SCORE .....  ###_  MY SCORE ....  ###";S2,S1
6420 LOCATE 22,1:PRINT USING "SUM OF CARDS ...  ##_  POINTS .......  ##";S9,P9
6430 LOCATE 24,1:PRINT SPC(39)
6440 RETURN
6450 REM ====================
6460 REM     ERASE A CARD
6470 REM ====================
6480 LOCATE LIN,PST:PRINT "       ":LIN=LIN -1:LOCATE LIN,PST:PRINT "       "
6490 LIN=LIN+2:LOCATE LIN,PST:PRINT "       ":LIN=LIN+1:LOCATE LIN,PST:PRINT "
   "
6500 LIN=LIN-4:LOCATE LIN,PST:PRINT "       "
6510 RETURN
6520 REM ========================
6530 REM     DATA FOR CARD VALUES
6540 REM ========================
6550 DATA 1,2,3,4,5,6,0,1,2,3,5,4,6,0,1,2,3,6,4,5,0
6560 DATA 1,2,4,5,3,6,0,1,2,4,6,3,5,0,1,2,5,6,3,4,0
6570 DATA 1,3,4,5,2,6,0,1,3,4,6,2,5,0,1,3,5,6,2,4,0
6580 DATA 1,4,5,6,2,3,0,2,3,4,5,1,6,0,2,3,4,6,1,5,0
6590 DATA 2,3,5,6,1,4,0,2,4,5,6,1,3,0,3,4,5,6,1,2,0
6600 DATA 1,1,1,2,3,09,1,1,2,2,3,12,1,1,2,3,3,12
6610 DATA 1,1,2,3,4,08,1,2,2,2,3,09,1,2,2,3,3,12
6620 DATA 1,2,2,3,4,08,1,2,3,3,3,09,1,2,3,3,4,08
6630 DATA 1,2,3,4,4,08,1,2,3,4,5,05
6640 DATA 1,1,2,3,6,1,2,2,3,6,1,2,3,3,6,1,2,3,4,4
6650 DATA 1,2,3,3
6660 DATA 1,2,3,4,5,6,A,2,3,4,5,6,7,8,9,10,J,Q,K
```

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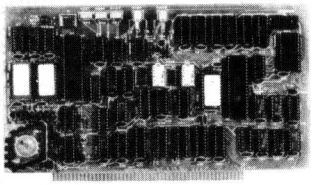

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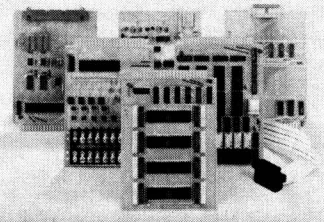

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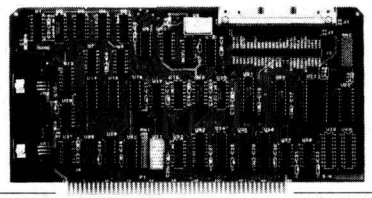

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Do-It-Yourself CP/M Utilities

If you're new to CP/M or assembly language, these simple CP/M utility programs for display and printer control should boost your self-confidence. For more experienced programmers, here are new utilities you can add to your system.

By Paul Frenger

Once you're familiar with the operation of your personal computer system, you begin to look for ways to increase its usefulness: Do more in less time with less mental effort.

Many small computers, such as the Apple II, TRS-80 models I and III and Compucolor II (now out of production), have useful disk-operating systems, but normally they communicate with the user in the immediate mode of a high-level language interpreter (for example, Microsoft Basic). While in this mode, nearly all control parameters of the attached peripherals can be easily initialized or modified by the operator.

For example, to clear the display screen, the Apple user can type "Home" at the system prompt, and voila! the screen clears and the cursor is moved to its first position. Visual clutter (and mental confusion) are reduced instantly. Another example: to set the Epson MX-80 printer to compressed mode while in Applesoft, you can type PR#1:PRINT CHR$(15) at the prompt.

CP/M machines do not have built-in high-level languages as a rule; these disk-resident languages must be loaded into the transient program area (TPA) before use.

The CP/M microcomputer normally interacts with the user at the operating system's command console processor (CCP) level. You have no innate access to the system peripherals' parameters or ports. At the minimum, you have to load the Basic interpreter from the disk to be able to perform the above simple tasks.

The user of the Apple II with a Microsoft Z-80 SoftCard is most acutely aware of this contrast, since he has both kinds of machine philosophies available to him (but not simultaneously). Regardless of arguments against the relative virtues of each system, one thing is clear to me: there are many times when I wished CP/M was as easy to use as the Apple II is.

This is where CP/M utility programs come in handy.

Writing your own utility programs for CP/M in 8080 assembly language

```
;       "PRINT132.COM"  MX-80 PRINTER UTILITY
;       by Paul Frenger MD
;
;====== DECLARATIONS ========================================
;
BDOS    EQU     0005H           ;CPM function entry address
LIST    EQU     5               ;list device output
STRING  EQU     9               ;BDOS console string output
COMPRES EQU     15              ;turns on compressed mode
;
        ORG     0100H           ;beginning of TPA
;
;====== MAIN PROGRAM ========================================
;
MAIN:   MVI     E,COMPRES       ;move code into E
        CALL    LPRINT          ;output it to printer
        LXI     D,MSG           ;acknowledge status
        CALL    PRINT           ;output it to console
        JMP     EXIT            ;done
;
;====== SUBROUTINES =========================================
;
LPRINT: MVI     C,LIST          ;setup C for function #5
        JMP     BDOS            ;execute it
;
PRINT   MVI     C,STRING        ;setup C for function #9
        JMP     BDOS            ;execute it
;
EXIT:   RET                     ;back to CCP
;
;====== MESSAGES ============================================

        MSG:    DB              '132-COLUMN MODE SET'
                DB              10,13,'$'
;
        END
```

Listing 1. CP/M utility to print 132-characters-per-line on an MX-80.

Address correspondence to Paul Frenger, M.D., 619 W. Main St., Houston, TX 77006.

```
;       "PRINT80.COM"  MX-80 PRINTER UTILITY
;       by Paul Frenger MD
;
;====== DECLARATIONS ====================================
;
BDOS    EQU     0005H           ;CPM function entry address
LIST    EQU     5               ;list device output
STRING  EQU     9               ;BDOS console string output
COMPOFF EQU     18              ;turns off compressed mode
;
        ORG     0100H           ;beginning of TPA
;
;====== MAIN PROGRAM ====================================
;
MAIN:   MVI     E,COMPOFF       ;move code into E
        CALL    LPRINT          ;output it to printer
        LXI     D,MSG           ;acknowledge status
        CALL    PRINT           ;output it to console
        JMP     EXIT            ;done
;
;====== SUBROUTINES =====================================
;
LPRINT: MVI     C,LIST          ;setup C for function #5
        JMP     BDOS            ;execute it
;
PRINT   MVI     C,STRING        ;setup C for function #9
        JMP     BDOS            ;execute it
;
EXIT:   RET                     ;back to CCP
;
;====== MESSAGES ========================================
;
        MSG:    DB              '80-COLUMN MODE SET'
                DB              10,13,'$'
;
        END
```

Listing 2. 80-characters-per-line-on-MX-80 utility.

is not hard to do. These short programs can be called by name from the CP/M prompt. They load quickly, execute immediately and return you to the system prompt. No time is wasted on loading a Basic interpreter.

Virtually all CP/M systems come complete with the tools needed for 8080 assembly-language programming: a text editor (ED.COM), an assembler (ASM.COM), a loader (LOAD.COM) and a debugger (DDT.COM).

CP/M is well-designed for interfacing to assembly-language programs such as these. Interaction with the console (display) and list device (printer) is accomplished through BDOS operating system calls. These are listed and explained in the Digital Research documentation (*CP/M 2.0 Interface Guide*, pp. 1-29) or in the SoftCard documentation (volume 1, pp. 3-41 to 3-63).

Additionally, the CP/M manuals explain the use of the editor, assembler and debugger in the creation of assembly-language programs. The reader is referred to these sources for further information if he is not familiar with them.

While learning to use the 8080 assembler, one should learn "structured programming," which involves creation of the program in an orderly way. Generally, the large processing tasks are outlined first; the smaller, detailed tasks are saved until later.

No code is written until this outline is complete and understood. This saves initial programming effort and makes your programs more readable so that they can be easily updated and maintained by other programmers.

The following simple utility programs (PRINT132.COM, PRINT80.COM and ERASE.COM) are intended to illustrate these concepts.

PRINT132.COM

This program switches the Epson MX-80 to compressed character mode, enabling it to print 132 characters per line. Typing PRINT132 at the prompt will load and run the program. Control returns to the CCP without a warm boot, thus saving time and disk wear.

What do we want the program to accomplish? Using what is called "structured English" (which is not a programming language, but a device to focus our attention), I decided to do the following with PRINT132.COM:

- Output the Control Code to the Printer
- Acknowledge the Printer Status at the Console
- Return to the CCP

(My MX-80 printer's user's manual gives the appropriate control codes in appendix B on page 81. The code to turn on the compressed character mode is ASCII 15.)

The necessary BDOS calls are:

#5—List Device Output (one ASCII character at a time)

#9—Console Output (a string of characters, terminated by "$")

Using "symbolic labels" and "equate directives" in the assembler makes the code seem much easier to work with and much more like a high-level language. The main program segment embodies the sense of the structured English sentences listed above; labelled subroutines perform the detail functions (in this case, the BDOS calls). The entire program is shown in Listing 1.

The program is created as a text file using ED.COM (or your favorite text processor). It must have the name PRINT132.ASM. Typing ASM PRINT132 will cause the assembler to generate two output files: PRINT132.PRN (which can be read using the CP/M type command) and PRINT132.HEX (which is the assembled 8080 machine code).

Next, try typing LOAD PRINT132, which will cause another output file to be created: PRINT132.COM (this is what the CCP actually loads and executes when you type PRINT132 at the prompt). If no errors are reported, you may erase the .ASM, .PRN and .HEX files if desired, leaving only the .COM file for your use. Alternatively, you may use PIP.COM to transfer these files to another diskette.

Typing PIP A:=B:PRINT132.* will transfer all four PRINT132 files from diskette A to B using the "wild card" copy feature of CP/M. (When using PRINT132, be sure the printer is turned on and "on line" or the control character may be ignored.)

PRINT80.COM

This program switches the Epson MX-80 back to the normal character mode, which prints 80 characters per line. Typing PRINT80 at the prompt will load and run the program. This utility reverses the effect of PRINT132.

The structured English for this program is the same as before. This time, the control code needed is ASCII 18. The only differences in this program

(compared to PRINT132) lie in the equates/labels for this control code and in the status message sent to the console.

A quick way to write this utility would be to edit a copy of PRINT132.ASM, being sure to rename the file PRINT80.ASM. Proceed with ASM and LOAD as given above. (See Listing 2 for the complete source program.)

ERASE.COM

This program erases the screen and homes the cursor before returning to the CCP. Typing "Erase" at the prompt will load and run the program.

The use of the mnemonic program name is a common practice; if you use Apple CP/M you might prefer the name HOME.COM instead, or something else of personal significance.

Display terminals differ in the control codes they require. Some terminals need a prefix code or "lead-in character" in order to properly accept the screen erase character. (Examples of these ASCII codes for three display terminals are provided in Table 1.)

In defining ERASE.COM, I out-

Terminal	Lead-in Character	Erase Character
Datamedia	(none)	12
Soroc 120	27	42
Hazeltine 1500	126	28

Table 1. Examples of ASCII codes for three different display terminals.

```
;       "ERASE.COM"  for Soroc 120
;       by Paul Frenger MD
;
;====== DECLARATIONS ========================================
;
BDOS    EQU     0005H           ;CPM function entry address
CHAR    EQU     2               ;BDOS console char output
LDIN    EQU     27              ;lead-in character
CLRSCR  EQU     170             ;clear screen character
;
        ORG     0100H           ;beginning of TPA
;
;====== MAIN PROGRAM ========================================
;
MAIN1:  MVI     E,LDIN          ;put lead-in char in E
        CALL    PRINT           ;output it to console
MAIN2:  MVI     E,CLRSCR        ;put screen clear char in E
        CALL    PRINT           ;output it to console
        JMP     EXIT            ;done
;
;====== SUBROUTINES =========================================
;
PRINT:  MVI     C,CHAR          ;setup C for function #2
        JMP     BDOS            ;execute it
;
EXIT:   RET                     ;back to CCP
;
        END
```

Listing 3. Screen-erasing program for the Soroc terminal.

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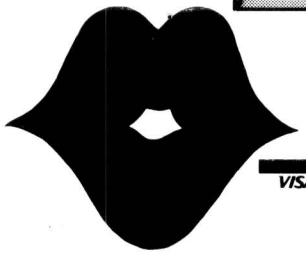

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lined the following structured English phrases:

- Output the Lead-In Character to the Console (if needed)
- Output the Screen Clear Character to the Console
- Return to the CCP

The assembler program that accomplishes this for the Soroc 120 (which requires a lead-in character) is shown in Listing 3. The equivalent program for the Hazeltine 1500 would be identical except for the values of "LDIN" and "CLRSCR" in the equate directives.

For the Datamedia, which doesn't need the lead-in, the "LDIN" declaration and all of "MAIN1" of the program code could be deleted; the correct value for "CLRSCR" should be used in the equates. These work with standard CP/M.

The Apple CP/M BIOS contains a table in the I/O Configuration Block which allows configuration of the display as a Soroc 120, Hazeltine 1500 or a Datamedia terminal. (This is described in the SoftCard documentation, Vol. 1, pp. 2-11 to 2-15.) Adding the ability to automatically recognize the terminal configuration and send the right codes to the display will complicate the ERASE.COM program a bit. According to the documentation, BIOS memory location 0F397H will contain the software lead-in character if a two-character erase sequence is needed. Otherwise this location will contain a 0.

Location 0F398H contains the actual software clear screen character. If a lead-in character is required, the most significant bit of location 0F398H will be set (equivalent to adding 080H to it). Otherwise, this bit will be reset to 0. Also, if the clear screen character is set to 0, the erase function is to be disabled.

The structured English for this would be:

- If the Screen Clear Character is Disabled, Quit;
- If not, check its Most Significant Bit;
- If it is Zero, Then Don't Output the Lead-In Character; Otherwise, Output the Lead-In Character to the Console;
- Output the Screen Clear Character to the Console;
- Return to the CCP.

The additions to the basic ERASE.COM program perform the appropriate memory reads, tests and branchings so that the proper codes are automatically generated with no additional effort on the user's part at runtime. Listing 4 shows these additions. Note that the values of the lead-in character and screen clear characters are not required in the equates section; only the addresses of these values are needed.

There are numerous other printer and screen attributes which can be manipulated using these programs as templates. By making your own utility programs for CP/M, you can gain confidence, improve your programming skills and solve a few minor (but sometimes annoying) system shortcomings.■

```
;       "ERASE.COM"  APPLE II SCREEN ERASE UTILITY
;       by Paul Frenger MD
;
;====== DECLARATIONS ========================================
;
BDOS    EQU     0005H           ;CPM function entry address
CHAR    EQU     2               ;BDOS console char output
LDIN    EQU     0F397H          ;lead-in character
CLRSCR  EQU     0F398H          ;clear screen character
;
        ORG     0100H           ;beginning of TPA
;
;====== MAIN PROGRAM ========================================
;
MAIN1:  LDA     CLRSCR          ;put screen clear char in A
        ORA     A               ;check for zero (disabled)
        JZ      EXIT            ;if disabled, quit
        RAL                     ;rotate MSB into CARRY flag
        CNC     MAIN2           ;if CARRY not set, skip lead-in
        LDA     LDIN            ;put lead-in char in A
        MOV     E,A             ;move into E
        CALL    PRINT           ;output it to console
MAIN2:  LDA     CLRSCR          ;put screen clear char back in A
        MOV     E,A             ;move into E
        CALL    PRINT           ;output it to console
        JMP     EXIT            ;done
;
;====== SUBROUTINES =========================================
;
PRINT:  MVI     C,CHAR          ;setup C for function #2
        JMP     BDOS            ;execute it
;
EXIT:   RET                     ;back to CCP
;
        END
```

Listing 4. Screen-erasing program for the Apple.

In Case You Missed It

Mark Robillard's "Intelligent Toaster" series, which has been running in *Microcomputing* since November 1982, will continue in May. This series tells you how to "build computer-controlled devices that speak and listen and manipulate their surroundings. . . ."

In our March 1983 issue, Robillard introduced the reader to components that are important in experimentation with single-chip microcomputers. Robillard also outlined the programming of an erasable EPROM and presented a chip pin-out. In the May installment, Robillard will provide details on the operation of this project.

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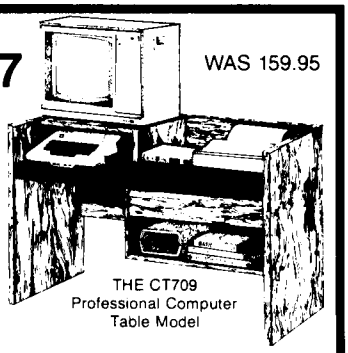

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Tricks You Can Use On Your Osborne

The author shares his discoveries on getting the most out of the Osborne 1—and rescues the reader from research.

By Kenniston W. Lord, Jr.

```
110 PRINT CHR$(26)  'CLEAR THE SCREEN
120 A$=CHR$(27)     'ESCape
130 B$=CHR$(41)     'START LOW INTENSITY
140 C$=CHR$(40)     'END LOW INTENSITY
150 D$=CHR$(108)    'START UNDERLINE
160 E$=CHR$(109)    'END UNDERLINE
170 T$="TEST MESSAGE"
180 PRINT A$;D$;A$;B$;T$;A$;C$;A$;E$
190 PRINT
200 PRINT:PRINT T$
210 PRINT
220 PRINT A$;B$;A$;D$;T$;A$;E$;A$;C$
230 PRINT:PRINT T$
240 PRINT
```

Listing 1. The Osborne 1's intensity and underlining features are demonstrated with this program.

```
10 PRINT CHR$(26)
20 A$=STRING$(39,"A")+" "
30 B$=STRING$(39,"B")+" "
40 C$=STRING$(39,"C")+" "
50 D$=STRING$(39,"D")+" "
60 E$=CHR$(27)
70 FOR N=1 TO 15
80 PRINT A$+B$
90 NEXT N
100 PRINT
110 FOR N=1 TO 15
120 PRINT C$+D$
130 NEXT N
140 RESTORE
150 FOR N=1 TO 4
160 READ Y,X
170 PRINT E$+"S"+CHR$(Y+32)+CHR$(X+32)
180 FOR Z=1 TO 1000:NEXT Z
190 NEXT N
200 GOTO 140
210 DATA 1,1,1,40,17,1,17,40
```

Listing 2. This program defines four 40-column sections of the screen, fills each with a different letter and moves them in sequence.

The Osborne 1's reference manual provides something about everything (all the associated software). But not everything you'd like to do is immediately obvious, so invariably you'll be doing some digging. As a result of my research, I've discovered a few things I'd like to share with *Microcomputing* readers.

Low Intensity and Underlining

The Osborne 1 operates naturally in high intensity, without underlining. Using the escape code (ASCII 27) coupled with other mode-setting ASCII codes, we can cause the Osborne 1 to start low intensity, end low intensity (by definition, begin high intensity), start underlining and end underlining. The program in Listing 1 demonstrates these capabilities in a couple of manners. If you've been questioning the manual's lack of instruction about these features, Listing 1 may help.

The trick, of course, is to precede the mode-setting attribute with the escape code, ASCII 27, *for each use.* Statement 180 starts the underline, shifts to low intensity, prints the test message, ends the low intensity and then ends the underline. Statement 220 merely reverses each sequence (preceding and following the printing of T$).

The Moving Window

While the display screen of the

Address correspondence to Kenniston W. Lord, Jr., 45 School St., Winchendon, MA 01475.

Listing 3. With this program, you can figure the coordinates of the physical and logical screen.

```
100 PRINT CHR$(26)
110 INPUT "ON WHAT LINE (1 - 24): ",WHAT.LINE
120 IF WHAT.LINE = 99 THEN 230
130 IF (WHAT.LINE < 1) OR (WHAT.LINE > 24) THEN 110
140 RESTORE
150 FOR N = 1 TO WHAT.LINE
160       READ A!,B!
170 NEXT N
180 FOR N = A! TO B!
190      POKE N, &H16
200 NEXT N!
210 PRINT CHR$(30)
220 GOTO 110
230 PRINT CHR$(30)
240 INPUT "ON WHAT COLUMN (1 - 52): ",WHAT.COLUMN
250 IF WHAT.COLUMN = 99 THEN PRINT CHR$(30):GOTO 110
260 IF (WHAT.COLUMN < 1) OR (WHAT.COLUMN > 52) THEN 230
270 RESTORE
280 FOR N = 1 TO 24
290      READ A!,B!
300 NEXT N
310 FOR N = 1 TO WHAT.COLUMN
320      READ A!,B!
330 NEXT N
340 FOR N = A! TO B! STEP 128
350      POKE N, &H7F
360 NEXT N
370 GOTO 230
1000 '*****************************
1010 '*  HORIZONTAL COORDINATES  *
1020 '*****************************
```

More

Osborne 1 shows a total of 1248 characters on a 24-line by 52-character screen, the actual screen is defined as 32 lines by 128 characters, or a total of 4096 (which is memory-mapped).

The physical screen (the one you can see) is located in the upper-left corner of the logical screen. You can see this logical screen via the horizontal scrolling capabilities (CP/M setup required) or by pressing the control key and shifting the screen with one of the arrow keys.

It is also possible to shift the screen under program control. Again, the escape code (ASCII 27) is required, and you must determine what point within the larger screen will be placed into the upper-left corner of the physical screen. Combining the escape code, the letter "S" (for screen), and the (x,y) coordinates (each of which have been offset by 32) will move that portion of the screen into view.

The program in Listing 2 defines four 40-column sections of the screen, fills each with a different alphabetic letter and moves them in sequence for you to view.

It follows that if we can block off the screen, as we have done here, to a screen length of 40, we can move any

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Listing 3 continued.

```
1030 DATA 61440,61492
1040 DATA 61568,61620
1050 DATA 61696,61748
1060 DATA 61824,61876
1070 DATA 61952,62004
1080 DATA 62080,62132
1090 DATA 62208,62260
1100 DATA 62336,62388
1110 DATA 62464,62516
1120 DATA 62592,62644
1130 DATA 62720,62772
1140 DATA 62848,62900
1150 DATA 62976,63028
1160 DATA 63104,63156
1170 DATA 63232,63284
1180 DATA 63360,63412
1190 DATA 63488,63540
1200 DATA 63616,63668
1210 DATA 63744,63796
1220 DATA 63872,63924
1230 DATA 64000,64052
1240 DATA 64128,64180
1250 DATA 64256,64308
1260 DATA 64384,64436
1270 '**************************
1280 '*  VERTICAL COORDINATES  *
1290 '**************************
1300 DATA 61440,64384
1310 DATA 61441,64385
1320 DATA 61442,64386
1330 DATA 61443,64387
1340 DATA 61444,64388
1350 DATA 61445,64389
1360 DATA 61446,64390
1370 DATA 61447,64391
1380 DATA 61448,64392
1390 DATA 61449,64393
1400 DATA 61450,64394
1410 DATA 61451,64395
1420 DATA 61452,64396
1430 DATA 61453,64397
1440 DATA 61454,64398
1450 DATA 61455,64399
1460 DATA 61456,64400
1470 DATA 61457,64401
1480 DATA 61458,64402
1490 DATA 61459,64403
1500 DATA 61460,64404
1510 DATA 61461,64405
1520 DATA 61462,64406
1530 DATA 61463,64407
1540 DATA 61464,64408
1550 DATA 61465,64409
1560 DATA 61466,64410
1570 DATA 61467,64411
1580 DATA 61468,64412
1590 DATA 61469,64413
1600 DATA 61470,64414
1610 DATA 61471,64415
1620 DATA 61472,64416
1630 DATA 61473,64417
1640 DATA 61474,64418
1650 DATA 61475,64419
1660 DATA 61476,64420
1670 DATA 61477,64421
1680 DATA 61478,64422
1690 DATA 61479,64423
1700 DATA 61480,64424
1710 DATA 61481,64425
1720 DATA 61482,64426
1730 DATA 61483,64427
1740 DATA 61484,64428
1750 DATA 61485,64429
1760 DATA 61486,64430
1770 DATA 61487,64431
1780 DATA 61488,64432
1790 DATA 61489,64433
1800 DATA 61490,64434
1810 DATA 61491,64435
1820 DATA 61492,64436
```

point along the 128-character x-axis or the 32-character y-axis that we wish.

The immediate benefit seems to be the ability to move across a spreadsheet program. What may not be so obvious is that graphics pictures may be developed out of the sight of the physical screen and then presented rapidly merely by repositioning the window.

Osborne Graphics

There are at least three ways to evoke graphics on the Osborne 1:

- Print graphics, whereby the graphics characters, which begin at ASCII 127 and end at ASCII 160, are printed. This routine would turn the screen white quickly:

> The visible screen, being but a part of the overall screen, can be manipulated graphically.

```
10 FOR N=1 TO 24
20 PRINT CHR$(150)
30 NEXT N
```

This process is, of course, relatively slow, and defies string packing because the actual line includes 128, not 52, characters. The prompt will scroll the screen.

- The second method is to shift to graphics mode, using a special code to enter (control-g) and another special code to exit (control-G). This mode allows direct entry from the keyboard according to a keyboard chart supplied in the reference manual.
- The final—and fastest—method is Poke graphics. To use the Poke graphics, it's useful to know some hexadecimal. The following program will turn the screen white quickly:

```
10 PRINT CHR$(26)
20 FOR N!=61440! TO 65535!
30 POKE N!,&H16
40 NEXT N
50 GOTO 50
```

The top 4K positions of two of the memory banks (the Osborne 1 is a three-bank system) are devoted to the video screen's memory map. In hex, the screen is addressed F000 to FFFF (61440 to 65535). Anything moved to that address will appear on the screen.

The visible screen, being but a smaller part of the overall screen, can be manipulated graphically if you have taken the time to determine the addresses. In the upper-left corner of the screen is the value 61440 (F000). This is the beginning of the entire screen area, both physical and logical. The line continues for 128 characters, passing into the logical screen at 61493 (F035). At 64612 (FC00) we are totally in the logical screen (the 25th line) and the entire screen memory map ends at 65535 (FFFF).

In order to see the entire graphics set fill the screen, the following program should be used:

```
10 X=0
20 PRINT CHR$(26)
30 FOR N!=61440! TO 65535!
40 POKE N!,X
50 NEXT N!
60 X=X+1
70 IF X=31 THEN 90
80 GOTO 20
90 GOTO 90
```

If you were watching, you noted that when in Poke mode (and in graphics mode as well), the graphics characters are generated from the first 32 characters of the character set (0-31). This may seem to be a conflict until you recognize that ASCII is technically a seven-bit code. In an eight-bit byte, or a nine-bit byte (as is the case with the Osborne 1) these can be any 32 characters.

You can sit down and figure the coordinates of the physical and logical screen, as I did, or you can draw them from Listing 3. This program simply "paints" the screen white (on a line you select) horizontally and paints it in mesh (on a column you select) vertically. There are 24 sets of horizontal coordinates and 52 sets of vertical coordinates, each stored in Data lines.

There's no doubt an easier way—but until it comes along, this one does the job.■

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CD4019	16	.39	CD4059	24	7.95	CD4529	16	1.19
CD4020	16	.75	CD4060	16	.89	CD4543	16	1.19
CD4021	16	.79	CD4066	14	.39	CD4562	14	6.95
CD4022	16	.79	CD4068	14	.39	CD4566	16	1.39
CD4023	14	.29	CD4069	14	.29	CD4583	16	2.49
CD4024	14	.69	CD4070	14	.39	CD4584	14	.59
CD4025	14	.23	CD4071	14	.29	CD4723	16	1.19
CD4026	16	2.49	CD4072	14	.29	CD4724	16	1.19
CD4027	16	.45	CD4073	14	.29	MC14409	16	13.95
CD4028	16	.69	CD4075	14	.29	MC14410	16	13.95
CD4029	16	.79	CD4076	16	.79	MC14411	24	11.95
CD4030	14	.39	CD4078	14	.49	MC14412	16	13.95
CD4034	24	1.95	**CD4081**	**14**	**.29**	MC14419	16	7.95
CD4035	16	.89	CD4082	14	.29	MC14433	24	13.95
(More in Catalog)			CD4093	14	.49	MC14536	16	1.19
						MC14541	14	1.19

MICROPROCESSOR COMPONENTS

MICROPROCESSOR CHIPS

Part No.	**Pins	Function	Price
CDP1802	40	CPU	$9.95
2650	40	MPU	14.95
IDM2901ADC	40	CPU—4-bit slice (Com. Temp. Gr.)	19.95
MCS6502	40	MPU w/Clock (65K bytes mem.)	9.95
MC6802CP	40	MPU w/Clock and RAM	7.95
INS8035N-6	40	MPU—8-bit (6MHz)	5.95
INS8039N-6	40	CPU-Sgl. chip 8-bit (128 bits Ram)	5.95
INS8040N-6	40	CPU (256 bytes RAM)	5.95
INS8070N	40	CPU (64 bytes RAM)	11.95
INS8073N	40	CPU w/Basic Micro Interpreter	14.95
P8085A	40	CPU	5.95

Z80, Z80A, Z80B, Z8000 SERIES

Z80	40	CPU (MK3880N)(780C) 2MHz	$4.95
Z80-CTC	28	Counter Timer Circuit	5.95
Z80-DART	40	Dual Asynchronous Rec./Trans.	11.95
Z80-DMA	40	Direct Memory Access Circuit	15.95
Z80-PIO	40	Parallel I/O Interface Controller	5.95
Z80-S10/0	40	Serial I/O (TxCB and RxCB Bonded)	15.95
Z80-S10/1	40	Serial I/O (Lacks DTRB)	15.95
Z80-S10/2	40	Serial I/O (Lacks SYNCB)	15.95
Z80-S10/9	40	Serial I/O	15.95
Z80A	40	CPU (MK3880N-4)(780C-1) 4MHz	5.95
Z80A-CTC	28	Counter Timer Circuit	5.95
Z80A-DART	40	Dual Asynchronous Rec./Trans.	11.95
Z80A-DMA	40	Direct Memory Access Circuit	17.95
Z80A-PIO	40	Parallel I/O Interface Controller	5.95
Z80A-S10/0	40	Serial I/O (TxCB and RxCB bonded)	16.95
Z80A-S10/1	40	Serial I/O (Lacks DTRB)	16.95
Z80A-S10/2	40	Serial I/O (Lacks SYNCB)	16.95
Z80A-S10/9	40	Serial I/O	16.95
Z80B	40	CPU (MK3880N-6) 6MHz	11.95
Z80B-CTC	28	Counter Timer Circuit	13.95
Z80B-PIO	40	Parallel I/O Interface Controller	13.95
Z8001	48	CPU Segmented	51.95
Z8002	40	CPU Non-Segmented	55.95
Z8030	40	Serial Comm. Controller	44.95
Z8036	40	Counter/Timer & Parallel I/O Unit	29.95

6800/68000 SERIES

MC6800	40	MPU	4.95
MC6802CP	40	MPU with clock and RAM	7.95
MC6810API	24	128x8 Static RAM	3.95
MC6821	40	Peripheral Inter. Adapt (MC6820)	4.95
MC6828	24	Priority Interrupt Controller	15.95
MC6830L8	24	1024x8-bit ROM (MC68A30-8)	10.95
MC6850	24	Asynchronous Comm. Adapter	4.95
MC6852	24	Synchronous Serial Data Adapter	5.75
MC6860	24	0-600bps Digital MODEM	9.95
MC6862	24	2400bps Modulator	12.95
MC6880A	16	Quad 3-state bus trans. (MC8126)	2.25
MC68000L8	64	MPU 16-Bit (8MHz)	69.95
MC68488P	40	General Purpose Int. Adapter	8.95
MC68652P2	40	Multi. Protocol Comm. Controller	24.95
MC68661PB	28	Enhanced Prog. Comm. Int.	8.95

8080A SERIES

INS8080A	40	CPU	3.95
TMS5501	40	Synchronous Data Interface (SIRC)	14.95
INS8154	40	128 Byte RAM 16-Bit I/O	13.95
INS82C06	20	Octal O Flip Flop Tri-State (74C374)	2.49
DP8212	24	8-bit Input/Output (74S412)	2.25
DP8214	24	Priority Interrupt Control Unit	3.95
DP8216	16	Bi-Directional Bus Driver	2.25
DP8224	16	Clock Generator/Driver	2.25
DP8226	16	Bus Driver	2.25
DP8228	28	System Cont. /Bus Driver (74S428)	3.49
DP8238	28	System Controller (74S438)	4.49
INS8243	24	I/O Expander for 48 Series	5.95
INS8245	18	16-Key Keyboard Encoder (74C922)	4.49
INS8246	20	20-Key Keyboard Encoder (74C923)	4.95
INS8247	28	Display Controller (74C911)	8.95
INS8248	28	Display Controller (74C912)	8.95
INS8250N	40	Asyn. Comm. Element (INS8250)	10.95
DP8251	28	Prog. Comm. I/O (USART)	4.49
DP8253	24	Prog. Interval Timer	6.95
DP8255	40	Prog. Peripheral I/O (PPI)	4.49
DP8257	40	Prog. DMA Control	7.95
DP8259	28	Prog. Interrupt Control	6.95
DP8275	40	Prog. CRT Controller	29.95
DP8279	40	Prog. Keyboard/Display Interface	6.95
DP8303	20	8-bit Tri-State Bi-Directional Trans.	3.95
DP8304	20	8-bit Bi-Directional Receiver	2.49
DP8307	20	8-bit Bi-Directional Receiver	2.49
DP8308	20	8-bit Bi-Directional Receiver	2.49
DP8310	20	Octal Latched Peripheral Driver	4.95
DP8311	20	Octal Latched Peripheral Driver	4.95

MICROPROCESSOR MANUALS & DATA BOOKS

M-280	User Manual	7.50
M-CDP1802	User Manual	7.50
M-2650	User Manual	5.00
10400	1982 Intel Data Book (1405 pg.)	14.95
30001	1981 Nat. CMOS Book (628 pg.)	6.95
30002	1980 Nat. Interface Book (640 pg.)	6.95
30003	1982 Nat. Linear Book (1952 pg.)	11.95
30005	1981 Nat. TTL Book (624 pg.)	9.95
30008	1980 Nat. Memory Data Book (464 pg.)	6.95
30011	1980 Nat. Linear Applications (736 pg.)	15.95
30013	1983 Zilog Data Book (541 pg.)	7.95
205610	1981 Intel Peripheral Design (828 pg.)	9.95

DYNAMIC RAMS

Part No.	**Pins		Price
1103	18	1024x1 (300ns)	.99
4027	**16**	**4096x1 (250ns)**	**2.49**
4116N-2	16	16,384x1 (150ns)	1.89 - 8/14.95
4116N-3	16	16,384x1 (200ns)	1.69 - 8/12.95
4116N-4	16	16,384x1 (250ns)	1.49 - 8/10.95
4164N-150	16	65,536x1 (150ns)	7.95 - 8/59.95
4164N-200	16	65,536x1 (200ns)	7.49 - 8/54.95
MM5261	18	1024x1 (300ns)	.49 - 8/1.95
MM5262	**22**	**2048x1 (365ns)**	**.49 — 8/1.95**
MM5270	18	4096x1 (250ns) MK4096	4.95
MM5280	22	4096x1 (200ns) 2107	3.95
MM5290-2	16	16,384x1 (150ns)	1.89 - 8/14.95
MM5290-3	16	16,384x1 (200ns)	1.69 - 8/12.95
MM5290-4	16	16,384x1 (250ns)	1.49 - 8/10.95
MM5298-3	16	8192x1 (200ns)	1.69

STATIC RAMS

1101	16	256x1	(650ns)	1.49
2101	22	256x4	(450ns) 8101	2.49
2102	16	1024x1	(350ns)	89
21L02	16	1024x1	(450ns) L.P.	1.49
2111	18	256x4	(450ns) 8111	2.95
2112	16	256x4	(450ns) MOS	2.95
2114	18	1024x4	(450ns)	1.95 - 8/13.95
2114L	18	1024x4	(450ns) L.P.	2.25 - 8/15.95
2114-2	18	1024x4	(200ns)	2.25 - 8/15.95
2114L-2	18	1024x4	(200ns) L.P.	2.49 - 8/17.95
2141-3	18	4096x1	(150ns)	3.95
2147	18	4096x1	(70ns)	4.95
2148	18	1024x4	(70ns)	8.95
TMS4044	18	4096x1	(450ns)	3.95
TMS4045	18	1024x4	(450ns)	3.95
5101	22	256x4	(450ns) CMOS	4.95
MM5257	18	4096x1	(450ns) 4044	4.95
HM6116P-3	24	2048x8	(150ns) CMOS	7.95
HM6116-4	24	2048x8	(200ns) CMOS	6.95
HM6116LP-4	24	2048x8	(200ns) L.P. CMOS	7.95
7489	16	16x4	(50ns) 3101	2.25
74C920	22	256x4	(250ns) CMOS (6551)	3.95
74C921	18	256x4	(250ns) CMOS	3.95
74C929	18	1024x1	(250ns) CMOS (6501)	3.95
74C930	18	1024x1	(250ns) CMOS (6518)	3.95
74S189	16	16x4	(35ns) 93405	1.95
74S200	16	256x1	(80ns) 93410	3.95
74S206	16	256x1	(50ns) 93411	3.95
74S289	16	16x4	(35ns) 3101	2.25
82S10	16	1024x1	(50ns) O.C. (93415)	3.95
82S25	16	16x4	(50ns) O.C. (74S289)	2.25

EPROMS

1702A	24	256x8	(1us) 4.95
2708	24	1024x8	(450ns) 3.95
2708-5	24	1024x8	(550ns) SM00246 2.95
TMS2516	24	2048x8	(450ns) 2716 6.95
TMS2532	24	4096x8	(450ns) NMC2532 9.95
TMS2564	28	8192x8	(450ns) 19.95
TMS2716	24	2048x8	(450ns) 3 voltage 7.95
2716	24	2048x8	(450ns) 4.95
2716-1	24	2048x8	(350ns) 6.95
2732	24	4096x8	(450ns) 9.95
2758Q	24	1024x8	(450ns) single +5V 2.95
MM2764	28	8192x8	(450ns) 16.95
MM2764-3	28	8192x8	(300ns) 19.95

PROMS

74S188	16	32x8	PROM O.C (6330-1) 1.49
74S287	16	256x4	PROM T.S. (6301-1) 1.95
74S288	16	32x8	PROM T.S. (6331-1) 1.95
74S387	16	256x4	PROM O.C. (6300-1) 1.95
74S471	20	256x8	PROM T.S. (6309-1) 5.95
74S472	20	512x8	PROM T.S. (6349-1) 4.95
74S473	20	512x8	PROM O.C. (6348) 4.95
74S474	24	1024x8	PROM T.S. (DM87S296N) 4.95
74S475	24	512x8	PROM O.C. (6340) 4.95
74S478	24	1024x8	PROM T.S. (TBP28S86) 8.95
74S570	16	512x4	PROM O.C. (6305) 2.95
74S571	16	512x4	PROM T.S. (6306) 2.95
74S572	18	1024x4	PROM O.C. (6352) 4.95
74S573	18	1024x4	PROM T.S. (82S137) 4.95
82S23	16	32x8	PROM O.C. (27S18) 2.95
82S115	24	512x8	PROM T.S. (27S15) 3.95
82S123	16	32x8	PROM O.C. (27S19) 2.95
82S126	16	256x4	PROM O.C. (27S20) 3.95
82S129	16	256x4	PROM T.S. (27S21) 3.95
82S130	16	512x4	PROM T.S. (27S12) 4.95
82S185	18	2048x4	PROM T.S. (TBP24S81) 9.95
DM87S180N	24	1024x8	PROM O.C (82S180) 9.95
DM87S181N	24	1024x8	PROM T.S. (82S181) 9.95
DM87S184N	18	2048x4	PROM O.C. (82S184) 9.95
DM87S185N	18	2048x4	PROM T.S. (82S185) 9.95
DM87S190N	24	2048x4	PROM O.C. (82S190) 19.95
DM87S191N	24	2048x8	PROM T.S. (82S191) 19.95

DATA ACQUISITION

DC10		Mostek DC/DC Convert. +5V to -9V 2.95
MC3447QP	18	Floppy Disc Head AMP Quad 4.95
MC1408L7	16	7-bit D/A Converter (DAC0807LCN) 2.49
MC1408L8	18	8-bit D/A Converter (DAC0808LCN) 2.95
ADC0804	20	8-bit A/D Converter (1 LSB) 3.49
DAC0806	16	8-bit D/A Converter (0.78% Lin.) 1.95
ADC0809	28	8-bit A/D Converter (8-Ch. Multi.) 4.49
AY-5-1013A	**40**	**30K Baud Uart (TR1602) 4.95**

CONNECTORS

DB25 — D Subminiature (meets RS232)

Part No.	Description	Price
DE9P	9 Pin Plug	$1.79
DE9S	9 Pin Socket	1.95
DA15P	15 Pin Plug	1.95
DA15S	15 Pin Socket	2.95
DB25P	**25 Pin Plug (Meets RS232)**	**2.49**
DB25S	**25 Pin Socket (Meets RS232)**	**3.25**
DB25P-831	25 Pin Right Angle Plug	4.95
DB25S-831	25 Pin Right Angle Socket	5.25
DC37P	37 Pin Plug	4.95
DC37S	37 Pin Socket	5.95
DD50P	50 Pin Plug	5.95
DD50S	50 Pin Socket	6.95

Accessories

DE-9H	Hood for DE-9 Series Connectors	$1.19
DA-15H	Hood for DA-15 Series Connectors	1.29
DB25H	Hood for DB25 Series Connectors	1.25
DC37H	Hood for DC37 Series Connectors	1.39
DD50H	Hood for DD50 Series Connectors	1.49
D20418-2	2 screws for mtg. connectors to a panel	.79

Solder Eyelet/Wire Wrap Edge Card

Part No.	Cnts	Sp	Description	Price
15/30SE	15/30	.156	Solder Eyelet	$1.79
18/36SE	18/36	.156	Solder Eyelet	1.95
22/44SE	22/44	.156	Solder Eyelet	2.49
22/44PC	22/44	.156	PC type (no mtg. ears)	.99
50/100SE	50/100	.125	Solder Eyelet	9.95
22/44WW	22/44	.156	Wire Wrap - Level 3	4.95
67031-5	22/44	.156	WW (Pins .062"x .03"x .75)	3.95
R-681-1	50/100	.125	Wire Wrap - Level 2	5.95
R-681-2	50/100	.125	Wire Wrap - Level 1	6.95

RF Coaxial Connectors

Part No.	Description	Price
PL259	UHF Plug	$ .89
SO239	UHF Panel Receptacle	.69
PL258	UHF Straight Adapter	.89
UG175/U	UHF Reducing Adapter	.49
UG88/U	BNC Plug	1.49
UG89/U	BNC Jack	1.69
UG306/U	BNC Angle Adapter	2.49
UG260/U	BNC Plug	1.49
UG1094/U	BNC Bulkhead Receptacle	.89

IC SOCKETS

For Socket Required, See Column After The IC Part No.

LOW PROFILE (TIN) SOCKETS

	1-9	10-99	100-999
8 pin LP	.18	.14	.13
14 pin LP	.17	.15	.14
16 pin LP	.19	.17	.16
18 pin LP	.26	.24	.23
20 pin LP	.30	.27	.25
22 pin LP	.31	.28	.26
24 pin LP	.33	.30	.28
28 pin LP	.40	.37	.35
36 pin LP	.46	.42	.39
40 pin LP	.49	.46	.43

— Soldertail Standard Tin & Gold Also Available —

WIRE WRAP (GOLD) SOCKETS

LEVEL #3	1-9	10-99	100-999
8 pin WW	.49	.45	.42
10 pin WW	.65	.62	.59
14 pin WW	.65	.62	.59
16 pin WW	.69	.65	.61
18 pin WW	.89	.85	.79
20 pin WW	1.09	1.05	.99
22 pin WW	1.25	1.19	1.15
24 pin WW	1.29	1.23	1.18
28 pin WW	1.59	1.50	1.45
36 pin WW	1.85	1.75	1.69
40 pin WW	1.99	1.89	1.79

**$10.00 Minimum Order — U.S. Funds

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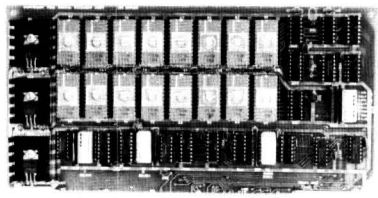
ALL SALES ARE MADE SUBJECT TO THE TERMS OF OUR 90 DAY LIMITED WARRANTY. A COPY OF THIS WARRANTY IS AVAILABLE FREE, ON REQUEST.

32K S-100 EPROM CARD
PRICE CUT!



$59.95

USES 2716's

Blank PC Board - $34

ASSEMBLED & TESTED ADD $30

SPECIAL: 2716 EPROM's (450 NS) Are $4.95 Ea. With Above Kit.

KIT FEATURES

1. Uses +5V only 2716 (2Kx8) EPROM's
2. Allows up to 32K of software on line!
3. IEEE S-100 Compatible
4. Addressable as two independent 16K blocks
5. Cromemco extended or Northstar bank select
6. On board wait state circuitry if needed
7. Any or all EPROM locations can be disabled
8. Double sided PC board, solder-masked, silk-screened
9. Gold plated contact fingers
10. Unselected EPROM's automatically powered down for low power
11. Fully buffered and bypassed
12. Easy and quick to assemble

64K S100 STATIC RAM

$269.00 KIT

NEW!

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD WITH DOCUMENTATION $55

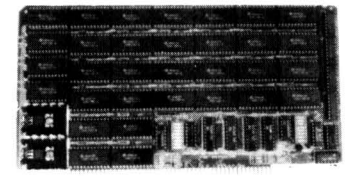
SUPPORT ICs + CAPS $17.50

FULL SOCKET SET $14.50

FULLY SUPPORTS THE NEW IEEE 696 S100 STANDARD (AS PROPOSED)

FOR 56K KIT $219

ASSEMBLED AND TESTED ADD $40



FEATURES:

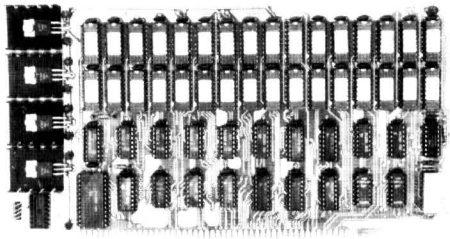
- Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- Fully supports IEEE 696 24 BIT Extended Addressing.
- 64K draws only approximately 500 MA.
- 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- SUPPORTS PHANTOM (BOTH LOWER 32K AND ENTIRE BOARD).
- 2716 EPROMs may be installed in any of top 48K.
- Any of the top 8K (E000 H AND ABOVE) may be disabled to provide windows to eliminate any possible conflicts with your system monitor, disk controller, etc.
- Perfect for small systems since BOTH RAM and EPROM may co-exist on the same board.
- BOARD may be partially populated as 56K.

16K STATIC RAM KIT-S 100 BUSS

PRICE CUT!

$119.95 KIT

FOR 4MHZ ADD $10



KIT FEATURES

1. Addressable as four separate 4K Blocks
2. ON BOARD BANK SELECT circuitry (Cromemco Standard!). Allows up to 512K on line!
3. Uses 2114 (450NS) 4K Static Rams
4. ON BOARD SELECTABLE WAIT STATES
5. Double sided PC Board with solder mask and silk screened layout. Gold plated contact fingers.
6. All address and data lines fully buffered
7. Kit includes ALL parts and sockets
8. PHANTOM is jumpered to PIN 67
9. LOW POWER: under 1.5 amps TYPICAL from the +8 Volt Buss
10. Blank PC Board can be populated as any multiple of 4K

BLANK PC BOARD W DATA-$33

LOW PROFILE SOCKET SET-$12

SUPPORT IC'S & CAPS-$19.95

ASSEMBLED & TESTED-ADD $35

OUR #1 SELLING RAM BOARD!

64K SS-50 STATIC RAM

$199.00 (48K KIT)

NEW!

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD WITH DOCUMENTATION $52

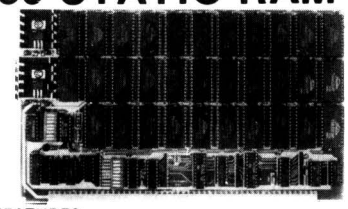
SUPPORT ICs + CAPS $18.00

FULL SOCKET SET $15.00

56K Kit $249

64K Kit $299

ASSEMBLED AND TESTED ADD $40



FEATURES:

- Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- Fully supports Extended Addressing.
- 64K draws only approximately 500 MA.
- 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- Board is configured as 3-16K blocks and 8-2K blocks (within any 64K block) for maximum flexibility.
- 2716 EPROMs may be installed anywhere on Board.
- Top 16K may be disabled in 2K blocks to avoid any I/O conflicts.
- One Board supports both RAM and EPROM.
- RAM supports 2MHZ operation at no extra charge!
- Board may be partially populated in 16K increments.

STEREO! S-100 SOUND COMPUTER BOARD

NEW!

At last, an S-100 Board that unleashes the full power of two unbelievable General Instruments AY3-8910 NMOS computer sound IC's. Allows you under total computer control to generate an infinite number of special sound effects for games or any other program. Sounds can be called in BASIC, ASSEMBLY LANGUAGE, etc.

COMPLETE KIT! **$69.95** (WITH DATA MANUAL)

BLANK PC BOARD W/DATA $31

KIT FEATURES:

- TWO GI SOUND COMPUTER IC'S
- FOUR PARALLEL I/O PORTS ON BOARD
- USES ON BOARD AUDIO AMPS OR YOUR STEREO
- ON BOARD PROTO TYPING AREA
- ALL SOCKETS, PARTS AND HARDWARE ARE INCLUDED
- PC BOARD IS SOLDERMASKED, SILK SCREENED, WITH GOLD CONTACTS
- EASY, QUICK, AND FUN TO BUILD, WITH FULL INSTRUCTIONS
- USES PROGRAMMED I/O FOR MAXIMUM SYSTEM FLEXIBILITY

Both Basic and Assembly Language Programming examples are included.

SOFTWARE:

SCL™ is now available! Our Sound Command Language makes writing Sound Effects programs a SNAP! SCL™ also includes routines for Register-Examine-Modify, Memory-Examine-Modify, and Play-Memory. SCL™ is available on CP/M* compatible diskette or 2708 or 2716 Diskette - **$24.95** 2708 - **$19.95** 2716 - **$29.95.** Diskette includes the source. EPROM'S are ORG at E000H. **(Diskette is 8 Inch Soft Sectored)**

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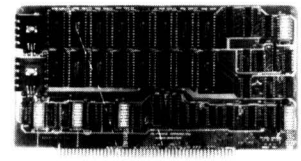

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We took our very popular 32K S100 EPROM Card and added additional logic to create a more versatile EPROM/RAM Board.

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- Supports Phantom
- On Board wait State Generator
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- Addressed as two separate 16K Blocks on any 64K Boundary
- Perfect for MP/M* Systems
- RAM Kit is very low power (300 MA typical)

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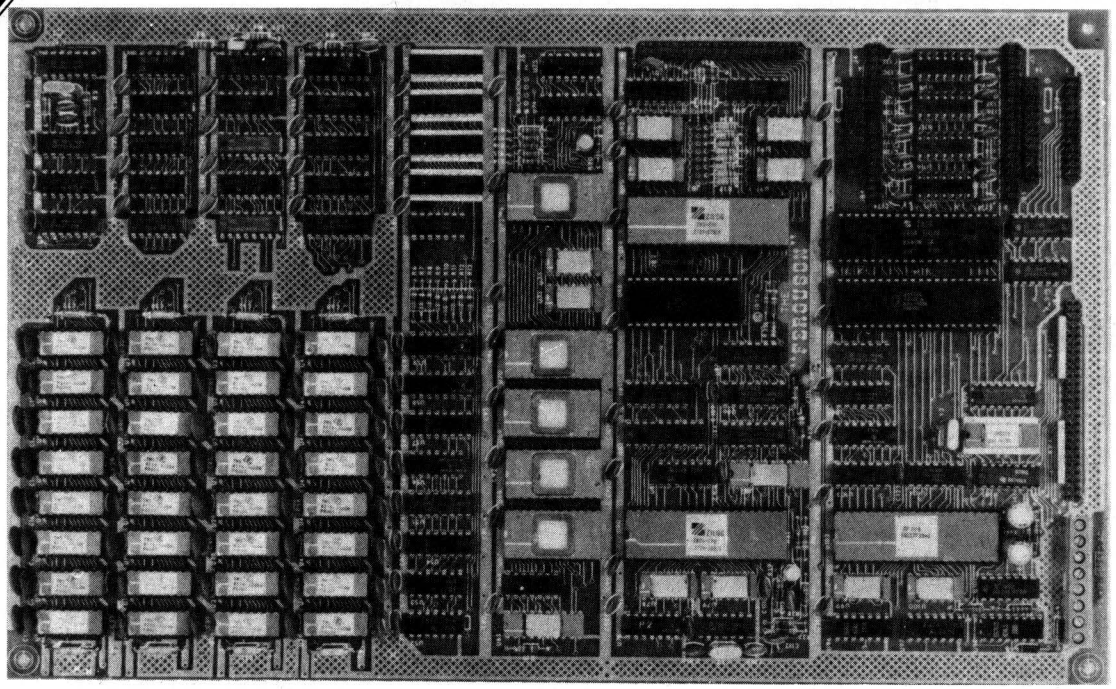

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SIZE: 8½ x 13¾ IN.
SAME AS AN 8 IN. DRIVE.
REQUIRES: +5V @ 3 AMPS
+ - 12V @ .5 AMPS.

FULLY SOCKETED!

FEATURES: (Remember, all this on one board!)

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Uses Industry standard 4116 RAM's. All 64K is available to the user, our VIDEO and EPROM sections do not make holes in system RAM. Also, very special care was taken in the RAM array PC layout to eliminate potential noise and glitches.

Z-80 CPU

Running at 2.5 MHZ. Handles all 4116 RAM refresh and supports Mode 2 INTERUPTS. Fully buffered and runs 8080 software.

SERIAL I/O (OPTIONAL)

Full 2 channels using the Z80 SIO and the SMC 8116 Baud Rate Generator. FULL RS232! For synchronous or asynchronous communication. In synchronous mode, the clocks can be transmitted or received by a modem. Both channels can be set up for either data-communication or data-terminals. Supports mode 2 Int. Price for all parts and connectors: $39.95

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Consists of separate parallel port (Z80 PIO) for use with an ASCII encoded keyboard for input. Output would be on the 80 x 24 Video Display.

BLANK PC BOARD — $119

The blank Big Board PC Board comes complete with full documentation (including schematics), the character ROM, the PFM 3.3 MONITOR ROM, and a diskette with the source of our BIOS, BOOT, and PFM 3.3 MONITOR.

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With a crisp, flicker-free display that looks extremely sharp even on small monitors. Hardware scroll and full cursor control. Composite video or split video and sync. Character set is supplied on a 2716 style ROM, making customized fonts easy. Sync pulses can be any desired length or polarity. Video may be inverted or true. 5 x 7 Matrix - Upper & Lower Case.

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Uses WD1771 controller chip with a TTL Data Separator for enhanced reliability. IBM 3740 compatible. Supports up to four 8 inch disc drives. Directly compatible with standard Shugart drives such as the SA800 or SA801. Drives can be configured for remote AC off-on. Runs CP/M* 2.2.

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The real power of the Big Board lies in its PFM 3.3 on board monitor. PFM commands include: Dump Memory, Boot CP/M*, Copy, Examine, Fill Memory, Test Memory, Go To, Read and Write I/O Ports, Disc Read (Drive, Track, Sector), and Search PFM occupies one of the four 2716 EPROM locations provided. Z-80 is a Trademark of Zilog.

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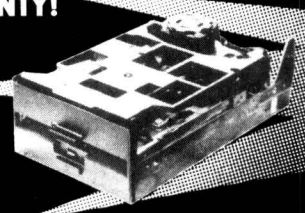

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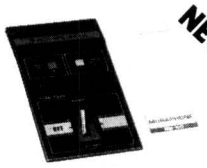

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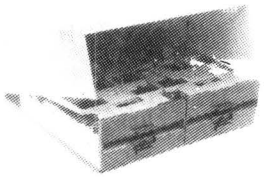

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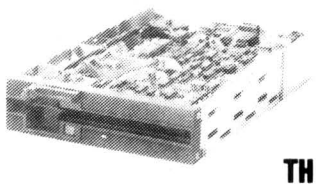

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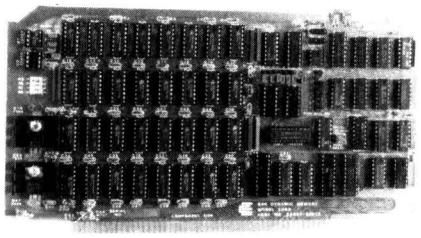

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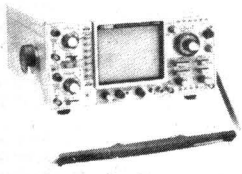

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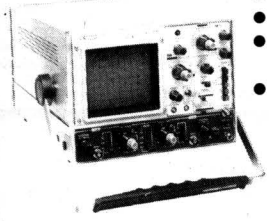

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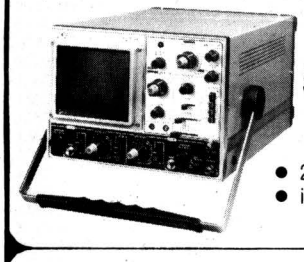

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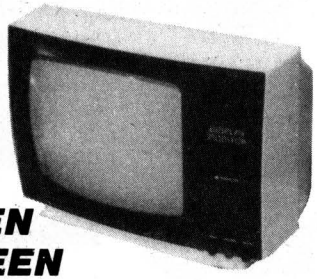

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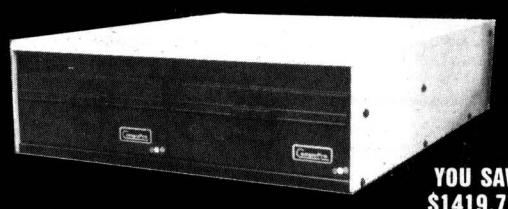

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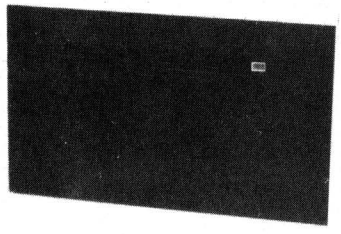

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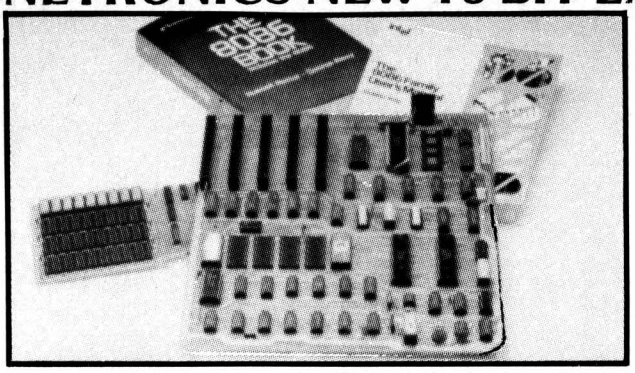

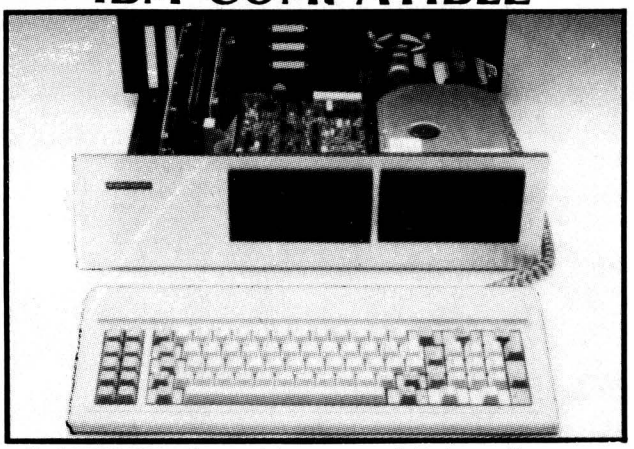

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The EXPLORER 88-PC STARTER'S KIT includes a mother board, memory/ I/O board, all components needed, sockets for IC's used, one 62-pin bus connector and complete assembly/test instructions. All you need is a soldering iron, solder, a +5 volt @ 3 amps & -5 & +/- 12 volt @.5 amp power supply, and a standard RS 232 terminal (Netronics has 2 low-cost ones to choose from).

☐ Explorer 88-PC Starter's Kit ...$399.95 + 10.00 p&i (wired & tested, add 100.00).
☐ Extra 62-pin connectors @ 4.25 ea. + 1.00 p&i.

If you do not own a terminal you may want to consider using our IBM compatible keyboard (see photo) in conjunction with an IBM compatible color graphics board. This combination, although not necessary at the introductory level, may be desirable if you plan to expand the EXPLORER 88-PC to be fully IBM compatible. These items require additional power and are only available wired and tested as follows:

☐ IBM compatible keyboard...$299.95 + 10.00 p&i
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☐ Additional ROM required...$35.00

The EXPLORER 88-PC can be expanded at any pace you decide. Invest and learn at a pace that is comfortable for you. Netronics is dedicated to supplying the finest hardware and software to make this a meaningful learning experience. Hard disks, built-in modem board, eprom burner, print buffer system plus more will be available shortly. The following items are available now:

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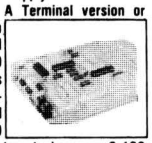

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5V = single 5 volt supply

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2.097152	3.95
2.4576	3.95
3.2768	3.95
3.579535	3.95
4.0	3.95
5.0	3.95
5.0688	3.95
5.185	3.95
5.7143	3.95
6.0	3.95
6.144	3.95
6.5536	3.95
8.0	3.95
10.738635	3.95
14.31818	3.95
15.0	3.95
16.0	3.95
17.430	3.95
18.0	3.95
18.432	3.95
20.0	3.95
22.1184	3.95
32.0	3.95

DATA ACQUISITION

ADC0800	15.55
ADC0804	3.49
ADC0809	4.49
ADC0817	9.95
DAC0800	4.95
DAC0806	1.95
DAC0808	2.95
DAC1020	8.25
DAC1022	5.95
MC1408L6	1.95
MC1408L8	2.95

8000

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8039	6.95
INS-8060	17.95
INS-8073	24.95
8080	3.95
8085	5.95
8085A-2	11.95
8086	29.95
8087	CALL
8088	39.95
8089	89.95
8155	7.95
8156	8.95
8185	29.95
8185-2	39.95
8741	39.95
8748	29.95
8755	32.00

8200

8202	29.95
8203	39.95
8205	3.50
8212	1.80
8214	3.85
8216	1.75
8224	2.25
8226	1.80
8228	3.49
8237	19.95
8238	4.49
8243	4.45
8250	10.95
8251	4.49
8253	6.95
8253-5	7.95
8255	4.49
8255-5	5.25
8257	7.95
8257-5	8.95
8259	6.90
8259-5	7.50
8271	39.95
8272	39.95
8275	29.95
8279	8.95
8279-5	10.00
8282	6.50
8283	6.50
8284	5.50
8286	6.50
8287	6.50
8288	25.00
8289	49.95

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MC4024	3.95
LM566	1.49
XR2206	3.75
8038	3.95

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ICL7103	9.50
ICL7106	9.95
ICL7107	12.95
ICL7660	2.95
ICL8038	3.95
ICM7207A	5.59
ICM7208	15.95

6800

68000	59.95
6800	4.95
6802	7.95
6808	13.90
6809E	19.95
6809	12.95
6810	2.95
6820	4.95
6821	3.25
6828	14.95
6840	12.95
6843	34.95
6844	25.95
6845	14.95
6847	12.25
6850	3.45
6852	5.75
6860	9.95
6862	11.95
6875	6.95
6880	2.25
6883	24.95
68047	24.95
68488	19.95
6800 - 1MHZ	
68B00	10.95
68B02	22.25
68B09E	29.95
68B09	29.95
68B10	7.95
68B21	12.95
68B45	35.95
68B50	12.95
68B00 - 2 MHZ	

6500

1 MHZ

6502	5.95
6504	6.95
6505	8.95
6507	9.95
6520	4.35
6522	8.75
6532	11.25
6545	22.50
6551	11.85

2 MHZ

6502A	9.95
6522A	11.70
6532A	12.40
6545A	28.50
6551A	12.95

3 MHZ

6502B	14.95

EXAR

XR 2206	3.75
XR 2207	3.85
XR 2208	3.90
XR 2211	5.25
XR 2240	3.25

9000 SERIES

9316	1.00
9334	2.50
9368	3.95
9401	9.95
9601	.75
9602	1.50
96S02	1.95

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'4LS00	.24	74LS86	.39	74LS169	1.75	74LS323	3.50
4LS01	.25	74LS90	.55	74LS170	1.49	74LS324	1.75
'4LS02	.25	74LS91	.89	74LS173	.69	74LS352	1.29
'4LS03	.25	74LS92	.55	74LS174	.55	74LS353	1.29
'4LS04	.24	74LS93	.55	74LS175	.55	74LS363	1.35
'4LS05	.25	74LS95	.75	74LS181	2.15	74LS364	1.95
'4LS08	.28	74LS96	.89	74LS189	8.95	74LS365	.49
'4LS09	.29	74LS107	.39	74LS190	.89	74LS366	.49
'4LS10	.25	74LS109	.39	74LS191	.89	74LS367	.45
'4LS11	.35	74LS112	.39	74LS192	.79	74LS368	.45
'4LS12	.35	74LS113	.39	74LS193	.79	74LS373	.99
'4LS13	.45	74LS114	.39	74LS194	.69	74LS374	.99
74LS14	.59	74LS122	.45	74LS195	.69	74LS377	1.39
74LS15	.35	74LS123	.79	74LS196	.79	74LS378	1.18
74LS20	.25	74LS124	2.90	74LS197	.79	74LS379	1.35
74LS21	.29	74LS125	.49	74LS221	.89	74LS385	1.90
74LS22	.25	74LS126	.49	74LS240	.95	74LS386	.45
74LS26	.29	74LS132	.59	74LS241	.99	74LS390	1.19
74LS27	.29	74LS133	.59	74LS242	.99	74LS393	1.19
74LS28	.35	74LS136	.39	74LS243	.99	74LS395	1.19
74LS30	.25	74LS137	.99	74LS244	.99	74LS399	1.49
74LS32	.29	74LS138	.55	74LS245	1.49	74LS424	2.95
74LS33	.55	74LS139	.55	74LS247	.75	74LS447	.37
74LS37	.35	74LS145	1.20	74LS248	.99	74LS490	1.95
74LS38	.35	74LS147	2.49	74LS249	.99	74LS624	3.99
74LS40	.25	74LS148	1.35	74LS251	.59	74LS668	1.69
74LS42	.49	74LS151	.55	74LS253	.59	74LS669	1.89
74LS47	.75	74LS153	.55	74LS257	.59	74LS670	1.49
74LS48	.75	74LS154	1.90	74LS258	.59	74LS674	9.65
74LS49	.75	74LS155	.69	74LS259	2.75	74LS682	3.20
74LS51	.25	74LS156	.69	74LS260	.59	74LS683	3.20
74LS54	.29	74LS157	.65	74LS266	.55	74LS684	3.20
74LS55	.29	74LS158	.59	74LS273	1.49	74LS685	3.20
74LS63	1.25	74LS160	.69	74LS275	3.35	74LS688	2.40
74LS73	.39	74LS161	.65	74LS279	.49	74LS689	3.20
74LS74	.35	74LS162	.69	74LS280	1.98	74LS783	24.95
74LS75	.39	74LS163	.65	74LS283	.69	81LS95	1.49
74LS76	.39	74LS164	.69	74LS290	.89	81LS96	1.49
74LS78	.49	74LS165	.95	74LS293	.89	81LS97	1.49
74LS83	.60	74LS166	1.95	74LS295	.99	81LS98	1.49
74LS85	.69	74LS168	1.75	74LS298	.89	25LS2521	2.80
				74LS299	1.75	25LS2569	4.25

IC SOCKETS

	1-99	100
8 pin ST	.13	.11
14 pin ST	.15	.12
16 pin ST	.17	.13
18 pin ST	.20	.18
20 pin ST	.29	.27
22 pin ST	.30	.27
24 pin ST	.30	.27
28 pin ST	.40	.32
40 pin ST	.49	.39
64 pin ST	4.25	call
ST = SOLDERTAIL		
8 pin WW	.59	.49
14 pin WW	.69	.52
16 pin WW	.69	.58
18 pin WW	.99	.90
20 pin WW	1.09	.98
22 pin WW	1.39	1.28
24 pin WW	1.49	1.35
28 pin WW	1.69	1.49
40 pin WW	1.99	1.80
WW = WIREWRAP		
16 pin ZIF	6.75	call
24 pin ZIF	9.95	call
28 pin ZIF	10.95	call

ZIF TEXTOOL
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CONNECTORS

RS232 MALE	2.95
RS232 FEMALE	3.50
RS232 FEMALE RIGHT ANGLE	5.25
RS232 HOOD	1.25
S-100 ST	3.95
S-100 WW	4.95

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4 POSITION	.85
5 POSITION	.90
6 POSITION	.90
7 POSITION	.95
8 POSITION	.95

7400

7400	.19	74132	.45
7401	.19	74136	.50
7402	.19	74141	.65
7403	.19	74142	2.95
7404	.19	74143	2.95
7405	.25	74145	.60
7406	.29	74147	1.75
7407	.29	74148	1.20
7408	.24	74150	1.35
7409	.19	74151	.55
7410	.19	74152	.65
7411	.25	74153	.55
7412	.30	74154	1.25
7413	.35	74155	.75
7414	.49	74156	.65
7416	.25	74157	.55
7417	.25	74159	1.65
7420	.19	74160	.85
7421	.35	74161	.69
7422	.35	74162	.85
7423	.29	74163	.69
7425	.29	74164	.85
7426	.29	74165	.85
7427	.29	74166	1.00
7428	.45	74167	2.95
7430	.19	74170	1.65
7432	.29	74172	5.95
7433	.45	74173	.75
7437	.29	74174	.89
7438	.29	74175	.89
7440	.19	74176	.89
7442	.49	74177	.75
7443	.65	74178	1.15
7444	.69	74179	1.75
7445	.69	74180	.75
7446	.69	74181	2.25
7447	.69	74182	.75
7448	.69	74184	2.00
7450	.19	74185	2.00
7451	.23	74186	18.50
7453	.23	74190	1.15
7454	.23	74191	1.15
7460	.23	74192	.79
7470	.35	74193	.79
7472	.29	74194	.85
7473	.34	74195	.85
7474	.33	74196	.79
7475	.45	74197	.75
7476	.35	74198	1.35
7480	.59	74199	1.35
7481	1.10	74221	1.35
7482	.95	74246	1.35
7483	.50	74247	1.25
7485	.59	74248	1.85
7486	.35	74249	1.95
7489	2.15	74251	.75
7490	.35	74259	2.25
7491	.40	74265	1.35
7492	.50	74273	1.95
7493	.35	74276	1.25
7494	.65	74279	.75
7495	.55	74283	2.00
7496	.70	74284	3.75
7497	2.75	74285	3.75
74100	1.75	74290	.95
74107	.30	74293	.75
74109	.45	74298	.85
74110	.45	74351	2.25
74111	.55	74365	.65
74116	1.55	74366	.65
74120	1.20	74367	.65
74121	.29	74368	.65
74122	.45	74376	2.20
74123	.49	74390	1.75
74125	.45	74393	1.35
74126	.45	74425	3.15
74128	.55	74426	.85
		74490	2.55

CMOS

4000	.29	4527	1.95
4001	.25	4528	1.19
4002	.25	4531	.95
4006	.89	4532	1.95
4007	.29	4538	1.95
4008	.95	4539	1.95
4009	.39	4541	2.64
4010	.45	4543	1.19
4011	.25	4553	5.79
4012	.25	4555	.95
4013	.38	4556	.95
4014	.79	4581	1.95
4015	.39	4582	1.95
4016	.39	4584	.75
4017	.69	4585	.75
4018	.79	4702	12.95
4019	.39	74C00	.35
4020	.75	74C02	.35
4021	.79	74C04	.35
4022	.79	74C08	.35
4023	.29	74C10	.35
4024	.65	74C14	.59
4025	.29	74C20	.35
4026	1.65	74C30	.35
4027	.45	74C32	.39
4028	.69	74C42	1.29
4029	.79	74C48	1.99
4030	.39	74C73	.65
4034	1.95	74C74	.65
4035	.85	74C76	.80
4040	.75	74C83	1.95
4041	.75	74C85	1.95
4042	.69	74C86	.39
4043	.85	74C89	4.50
4044	.79	74C90	1.19
4046	.85	74C93	1.75
4047	.95	74C95	.99
4049	.35	74C107	.89
4050	.35	74C150	5.75
4051	.79	74C151	2.25
4053	.79	74C154	3.25
4060	.89	74C157	1.75
4066	.39	74C160	1.19
4068	.39	74C161	1.19
4069	.29	74C162	1.19
4070	.35	74C163	1.19
4071	.29	74C164	1.39
4072	.29	74C165	2.00
4073	.29	74C173	.79
4075	.29	74C174	1.19
4076	.79	74C175	1.19
4078	.29	74C192	1.49
4081	.29	74C193	1.49
4082	.29	74C195	1.39
4085	.95	74C200	5.75
4086	.95	74C221	1.75
4093	.49	74C373	2.45
4098	2.49	74C374	2.45
4099	1.95	74C901	.39
14409	12.95	74C902	.85
14410	12.95	74C903	.85
14411	11.95	74C905	10.95
14412	12.95	74C906	.95
14419	7.95	74C907	1.00
14433	4.18	74C908	2.00
4502	.95	74C909	2.75
4503	.65	74C911	8.95
4508	1.95	74C912	8.95
4510	.85	74C914	1.95
4511	.85	74C915	1.19
4512	.85	74C918	2.75
4514	1.25	74C920	17.95
4515	1.79	74C921	15.95
4516	1.55	74C922	4.49
4518	.89	74C923	4.95
4519	.39	74C925	5.95
4520	.79	74C926	7.95
4522	1.25	74C928	7.95
4526	1.25	74C929	19.95

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74S02	.35	74S168	3.95
74S03	.35	74S169	3.95
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74S05	.35	74S175	.95
74S08	.35	74S181	3.95
74S09	.40	74S182	2.95
74S10	.35	74S188	1.95
74S11	.35	74S189	6.95
74S15	.35	74S194	1.49
74S20	.35	74S195	1.49
74S22	.35	74S196	1.49
74S30	.35	74S197	1.49
74S32	.40	74S201	6.95
74S37	.88	74S225	7.95
74S38	.85	74S240	2.20
74S40	.35	74S241	2.20
74S51	.35	74S244	2.20
74S64	.40	74S251	.95
74S65	.40	74S253	.95
74S74	.50	74S257	.95
74S85	1.99	74S258	.95
74S86	.50	74S260	.79
74S112	.50	74S274	19.95
74S113	.50	74S275	19.95
74S114	.55	74S280	1.95
74S124	2.75	74S287	1.90
74S132	1.24	74S288	1.90
74S133	.45	74S289	6.89
74S134	.50	74S301	6.95
74S135	.89	74S373	2.45
74S138	.85	74S374	2.45
74S139	.85	74S381	7.95
74S140	.55	74S387	1.95
74S151	.95	74S412	2.98
74S153	.95	74S471	4.95
74S157	.95	74S472	4.95
74S158	.95	74S474	4.95
74S161	1.95	74S482	15.25
74S162	1.95	74S570	2.95
		74S571	2.95

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- ★ Very competitive prices!
- ★ Friendly staff!
- ★ Fast service — most orders shipped within 24 hours!

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HP 5082-7760	.6"	CC	1.29
MAN 72	.3"	CA	.99
MAN 74	.3"	CC	.99
FND-357 (359)	.375"	CC	1.25
FND-500 (503)	.5"	CC	1.49
FND-507 (510)	.5"	CA	1.49

LED LAMPS

	1-99	100-up
Jumbo Red	.10	.09
Jumbo Green	.18	.15
Jumbo Yellow	.18	.15

TRANSISTORS DIODES

PN2222	NPN SWITCH	TO-92	10/1.00	100/8.99
PN2907	PNP SWITCH	TO-92	10/1.25	100/10.99
2N2222	NPN SWITCH	TO-18	.25	50/10.99
2N2907	PNP SWITCH	TO-18	.25	50/10.99
2N3055	NPN POWER	TO-3	.79	10/6.99
3055T	NPN POWER	TO-220	.69	10/5.99
2N3904	NPN SWITCH	TO-92	10/1.00	100/8.99
2N3906	NPN SWITCH	TO-92	10/1.00	100/8.99
IN4148 (IN914)	SWITCHING		25/1.00	1000/35.00
IN4004	RECTIFIER		10/1.00	100/8.99

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LINEAR

LM301	.34	LM348	.99	NE564	2.95	LM1496	.85
LM301H	.79	LM350K	4.95	LM565	.99	LM1558H	3.10
LM307	.45	LM350T	4.60	LM566	1.49	LM1800	2.37
LM308	.69	LM358	.69	LM567	.89	LM1812	8.25
LM308H	1.15	LM359	1.79	NE570	3.95	LM1830	3.50
LM309H	1.95	LM376	3.75	NE571	2.95	LM1871	5.49
LM309K	1.25	LM377	1.95	NE592	2.75	LM1872	5.49
LM310	1.75	LM378	2.50	LM703	.89	LM1877	3.25
LM311	.64	LM379	4.50	LM709	.59	LM1889	1.95
LM311H	.89	LM380	.89	LM710	.75	LM1896	1.75
LM312H	1.75	LM380N-8	1.10	LM711	.79	LM2877	2.05
LM317K	3.95	LM381	1.60	LM723	.49	LM2878	2.25
LM317T	1.19	LM382	1.60	LM723H	.55	LM2900	.85
LM318	1.49	LM383	1.95	LM733	.98	LM2901	1.00
LM318H	1.59	LM384	1.95	LM741	.35	LM3900	.59
LM319H	1.90	LM386	.89	LM741N-14	.35	LM3905	1.25
LM319	1.25	LM387	1.40	LM741H	.40	LM3909	.98
LM320 (see 7900)		LM389	1.35	LM747	.69	LM3911	2.25
LM322	1.65	LM390	1.95	LM748	.59	LM3914	3.95
LM323K	4.95	LM392	.69	LM1014	1.19	LM3915	3.95
LM324	.59	LM394H	4.60	LM1303	1.95	LM3916	3.95
LM329	.65	LM399H	5.00	LM1310	1.49	MC4024	3.95
LM331	3.95	NE531	2.95	MC1330	1.69	MC4044	4.50
LM334	1.19	NE536	6.00	MC1349	1.89	RC4136	1.25
LM335	1.40	NE555	.34	MC1350	1.19	RC4151	3.95
LM336	1.75	NE556	.65	MC1358	1.69	LM4250	1.75
LM337K	3.95	NE558	1.50	MC1372	6.95	LM4500	3.25
LM337T	1.95	NE555	.34	LM1414	1.59	LM13080	1.29
LM338K	6.95	NE556	.65	LM1458	.59	LM13600	1.49
LM339	.99	NE558	1.50	LM1488	.69	LM13700	1.49
LM340 (see 7800)		NE561	24.95	LM1489	.69		

H = TO-5 CAN T = TO-220 K = TO-3

RCA

CA 3023	2.75	CA 3082	1.65
CA 3039	1.29	CA 3083	1.55
CA 3046	1.25	CA 3086	.80
CA 3059	2.90	CA 3089	2.99
CA 3060	2.90	CA 3096	3.49
CA 3065	1.75	CA 3130	1.30
CA 3080	1.10	CA 3140	1.15
CA 3081	1.65	CA 3146	1.85
		CA 3160	1.19

TI

TL494	4.20	75365	1.95
TL496	1.65	75450	.59
TL497	3.25	75451	.39
75107	1.49	75452	.39
75110	1.95	75453	.39
75150	1.95	75454	.39
75154	1.95	75491	.79
75188	1.25	75492	.79
75189	1.25	75493	.89
		75494	.89

BI FET

TL071	.79	TL084	2.19
TL072	1.19	LF347	2.19
TL074	2.19	LF351	.60
TL081	.79	LF353	1.00
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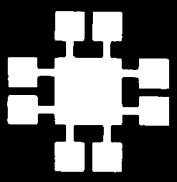

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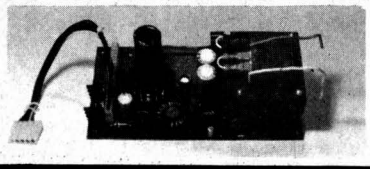

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7442	45	74154	1.00	74LS42	50	74LS151	70	74LS260	80		
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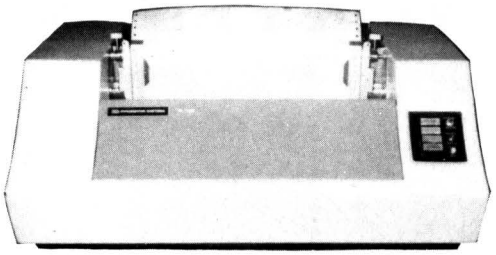

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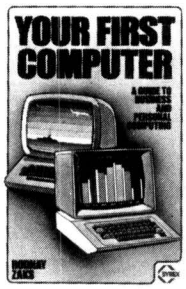

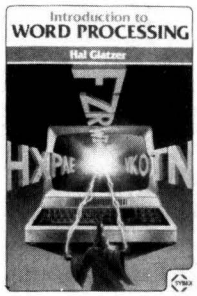

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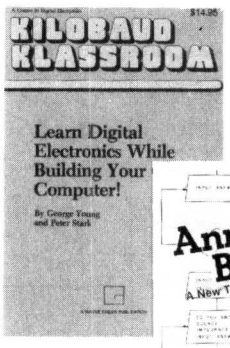

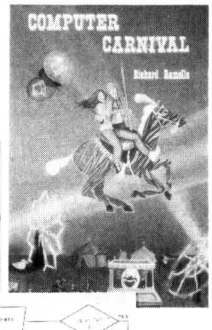

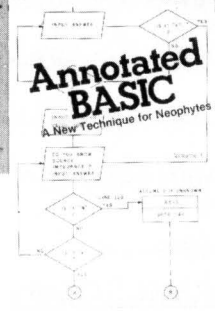

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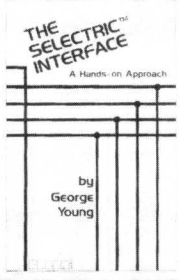

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THE APPLE II USER'S GUIDE—By Lon Poole, Martin McNiff, and Steven Cook This guide is the key to unlocking the full power of your Apple II or Apple II Plus. Topics include: "Applesoft and Integer BASIC Programming"—especially how to make the best use of Apple's sound, color and graphics capabilities. "Machine Level Programming," "Hardware Features" —which covers the disk drive and printer, and "Advanced Programming"—describing high resolution graphics techniques and other advanced applications. Well organized and easy to use. BK1220 $16.95

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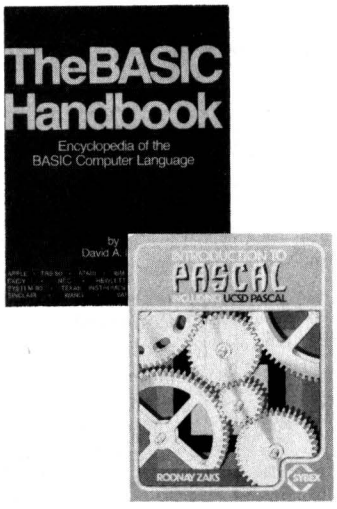

LEARNING IBM BASIC FOR THE PERSONAL COMPUTER—by David A. Lien This is a comprehensive how-to book that will help you get the most for your IBM-PC. A completer BASIC tutorial, it puts your PC to work *while* you learn BASIC. This has been written with the beginner in mind and encourages learning in a relaxed and enjoyable manner with its easy step-by-step instructions. It's also a excellent text for the classroom. BK1273 $19.95

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Z-80

INSIDE LEVEL II—For machine language programmers. This is a comprehensive reference guide to the Level II ROMs, allowing easy utilization of the sophisticated routines they contain. It concisely explains set-ups, calling sequences, variable passage and I/O routines. Part II presents an entirely new composite program structure which unloads under the SYSTEM command and executes in both BASIC and machine code with the speed and efficiency of a compiler. Special consideration is given to disk systems. BK1183 $15.95.*

PROGRAMMING THE Z-80—by Rodnay Zaks. Here is assembly language programming for the Z-80 presented as a progressive, step-by-step course. This book is both an educational text *and* a self-contained reference book, useful to both the beginning and the experienced programmer who wish to learn about the Z-80. Exercises to test the reader are included. BK1122 $15.95.*

Z-80 ASSEMBLY LANGUAGE PROGRAMMING—by Lance A. Leventhal. This book thoroughly covers the Z-80 instruction set, abounding in simple programming examples illustrating software development concepts and actual assembly language usage. Features include Z-80 I/O devices and interfacing methods, assembler conventions, and comparisons with 8080A/8085 instruction sets and interrupt structure. BK1177 $16.99.*

68000/6809

68000 MICROPROCESSOR HANDBOOK—By Gerry Kane. Whether you're currently using the 68000, planning to use it, or simply curious about one of the newest and most powerful microprocessors, this handbook has all the answers. A clear presentation of signal conversions, timing diagram conventions, functional logic, three different instruction set tables, exception processing, and family support devices provides more information about the 68000 than the manufacturer's data sheets. A stand alone reference book which can also be used as a supplement to *An Introduction to Microcomputers: Vol. 2—Some Real Microprocessors.* BK1216 $9.95

68000 ASSEMBLY LANGUAGE PROGRAMMING—by Gerry Kane, et al. A straightforward self teaching text book on assembly language programming for the 68000 microprocessor. This book contains the entire instruction set, describes the function of assemblers and assembly instructions and discusses basic software development concepts. A large number of practical programming examples are included. BK1233 $16.99

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Micro Software Digest

Compiled by Swain Pratt

Micro Software Digest presents capsulized software reviews from various computer-related publications.

Scribble

System Requirements: CP/M operating system; most small-system printers
Manufacturer: Mark of the Unicorn, PO Box 423, Arlington, MA 02174. **Price:** $175
Comments: Scribble is a text processor that, according to the review, obviates step-by-step instructions through predefined "environments," sections of text that are usually formatted in certain ways. The review describes Scribble as "a high-level language for text processing that encourages users to concentrate on the structure of the document."

"Scribble is at its best," the review states, "when it is used to produce long or complex documents" and it is "capable of using the sophisticated hardware features of the most common small-system printers." Reader Service Number 401

(Reviewed in BYTE, *February 1983)*

Personal Finance and Record Keeping

System Requirements: Atari 400 or 800; 40K RAM; Atari Basic language cartridge; Atari 810 and a printer
Manufacturer: Scitor Corp., 710 Lakeway, Suite 290, Sunnyvale, CA 94086. **Price:** $79.95
Comments: Personal Finance and Record Keeping offers check-handling functions, report utilities, bar charts and line graphs, electronic scratch pads, a two-way interface with VisiCalc and other useful features, according to the review.

Since it is written in Basic, the program is slow in formatting and search functions, but, concludes the review, it "is a worthwhile addition to anyone's software library . . . easy to use, well-documented." Reader Service Number 402

(Reviewed in Softside, *Vol. 6, #4)*

Home Finance Program for the IBM PC

System Requirements: IBM PC with 64K RAM, monochrome or color display, one disk drive and optional printer
Manufacturer: Design Data Systems Corp., 5270 N. Park Place N.E., Cedar Rapids, IA 52402. **Price:** $100
Comments: Home Finance Program for the IBM PC is, states the review, "a no-nonsense, no-frills, flexible series of four programs: budget analysis, checking account analysis, savings account analysis and a loan-amortization program."

The review found the budget program a good and useful one, but was not enthusiastic about the others, saying the checking account program was tedious and the last two were of little value. Reader Service Number 403

(Reviewed in Softside, *Vol. 6, #4)*

Smartcom

System Requirements: IBM PC; 128K RAM; Hayes Smartmodem 1200; subscription to a database
Manufacturer: Hayes Microcomputer Products, 5835 Peachtree Corners East, Norcross, GA 30092. **Price:** $119
Comments: Smartcom makes it easy to call database utilities, according to the review. "The utility you select," says the review, "is automatically accessed by means of a set of macro-instructions, or subprograms on the disk."

The sets of instructions can also be edited to give you automatic access to applications of your choice in a given databank, states the review. Reader Service Number 404

(Reviewed in Personal Computing, *February 1983)*

VisiLink

System Requirements: Apple II Plus; 48K RAM; two disk drives; an autodial modem such as Hayes MicroModel II, Novation Apple-Cat II or 212 Apple-Cat II
Manufacturer: Visicorp, 2985 Zanker Road, San Jose, CA 95134.
Price: $250
Comments: "VisiLink," says the review, "connects Apple II Plus users to the database maintained by Data Resources, Inc. (DRI), of Lexington, MA." As an integrated communications and data system, VisiLink saves you money by cutting down on-line time.

According to the review, the user also saves time because he gets the information in VisiCalc file formats, which he can save, load into his spreadsheet program and manipulate as he would with data he enters himself. Reader Service number 405

(Reviewed in Personal Computing, *January 1983)*

Merlin

System Requirements: Apple II; 16K RAM card; ROM Applesoft; one disk drive
Manufacturer: Southwestern Data Systems, 10761-E Woodside Ave., Santee, CA 92071. **Price:** $64.95
Comments: "Merlin may be the best assembler we will ever see for the Apple II," says the review. "It's set up to make assembly programming as interactive as possible."

One of a number of excellent features, according to the review, "the editor incorporates some of the features of a word processor . . . and has a classy bonus . . . it can translate between decimal and hexadecimal." The review concludes that Merlin is a superb assembler. Reader Service Number 406

(Reviewed in Softalk, *January 1983)*

Data*Trans

System Requirements: Apple II; 48K RAM; ROM Applesoft; one disk drive
Manufacturer: ABT Microcomputer Software, 55 Wheeler St., Cambridge, MA 02138. **Price:** $100
Comments: Data*Trans, according to the review, "is certainly one of the most versatile telecommunications packages to date. It allows the Apple to interface with main frames, minis and micros." This innovative program deals with all aspects of electronic mail such as autodialing and remote control of your Apple.

"One of Data*Trans's most useful features," concludes the review, "is the ability to work with and edit text files while on-line . . . all in all, this is a very impressive package that's easy to use and thoroughly documented." Reader Service Number 407

(Reviewed in Softalk, *January 1983)*

Tax Byte '82

System Requirements: Apple II or II Plus; DOS 3.3; 48K RAM
Manufacturer: Century Software Ltd., PO Box 26516, Phoenix, AZ 85068. **Price:** $47.95
Comments: According to the review, Tax Byte '82 is "a program that can be quite helpful to a wage earner who normally goes to the corner tax accountant in April." In Tax Byte's common sense approach, says the review, "you work through several spreadsheets and fill in each line as you would on a Form 1040."

Tax Byte provides all the schedules you would ordinarily need, states the review, although some of these are somewhat abbreviated. The program is easy to use, concludes the review, and a Help screen is available. Reader Service Number 408

(Reviewed in Popular Computing, *March 1983)*

Visitrend/Visiplot

System Requirements: Apple II or IBM PC
Manufacturer: Visicorp, Inc., 2895 Zanker Road, San Jose, CA 95134. **Price:** $300
Comments: "If anything," says the review, "this package is even easier to use and more exciting than Visicalc itself. Visitrend/Visiplot lets you create, modify, display and print graphs and charts that may range from simple relationships to representations of sophisticated statistical data."

Visitrend is a forecasting and computation package, whereas Visiplot is a graphics-generating tool, according to the review, with software to dump screen graphics to a printer. The program, concludes the review, "is an exciting tool for anyone who must evaluate and present large quantities of data to others in graphic form." Reader Service Number 409

(Reviewed in Popular Computing, *March 1983)*

WordStar

System Requirements: CP/M; minimum of 32K RAM; disk drive system with at least 100K
Manufacturer: MicroPro International Corp., 1299 Fourth St., San Rafael, CA 94901. **Price:** $495
Comments: WordStar, according to the review, is a complex word processor written in assembly language. "One of the best features of WordStar," says the review, "is that you see what you get . . . almost." It is a powerful tool, but does not handle graphics.

"The software is elegant, complete and well-executed," concludes the review. "However, its capabilities can be intimidating to a beginning user." Reader Service Number 411

(Reviewed in Interface Age, *February 1983)*

MasterType

System Requirements: Atari 400 or 800; 32K—diskette
Manufacturer: Lightning Software, PO Box 11725, Palo Alto, CA 94306. **Price:** $39.95
Comments: "MasterType makes a game out of learning touch typing," says the review. The learner must watch the screen and protect his spaceship by typing the "enemy" words that stream toward it.

"Eighteen lessons are provided, each with four levels of play," states the review. "Even those of you who only need to improve your typing will be able to benefit from this product." Reader Service Number 412

(Reviewed in ANTIC, *December/January 1983)*

SPEEDREAD+

System Requirements: Atari 400 or 800; 16K—diskette, cassette
Manufacturer: Optimized Systems Software, Inc., 10379 Lansdale Ave., Cupertino, CA 95014. **Price:** $59.95
Comments: SPEEDREAD+, according to the review, is a program that "allows your Atari computer system to function like an electric tachistoscope . . . a device for displaying words and phrases at various speeds." The text used, states the review, is taken from three classic short stories.

"The program offers reading speeds from five words per minute to 5000," says the review, and "various displays are used to develop different skills such as rapid recognition, peripheral vision and rhythmic eye movement." Reader Service Number 413

(Reviewed in ANTIC, *December/January 1983)*

The Last One

System Requirements: CP/M-80 compatible machines, such as TRS-80, Model II or Apple II; two disk drives
Manufacturer: D.J.'s 'A1' Systems, Ltd., Two Century Plaza, Suite 480, 2049 Century Park E., Los Angeles, CA 90067. **Price:** $600
Comments: Advertised as a program generator, "The Last One is somewhat like a simple-minded assistant with a good memory," says the review. "Before you use it, you need a clear idea of the work you want your proposed applications program to do and how you want that work accomplished."

The program keeps asking you questions and then generates the program code according to your instructions. "It relies on you," concludes the review, "for much of the work and nearly all the decisions that must be made." Reader Service Number 410

(Reviewed in Popular Computing, *March 1983)*

ANTIC, 297 Missouri St., San Francisco, CA 94107.

BYTE, 70 Main St., Peterborough, NH 03458.

Interface Age, published by McPheters, Wolfe and Jones, 16704 Marquardt Ave., Carritos, CA 90701.

Personal Computing, published by Hayden Publishing Co., Inc., 50 Essex St., Rochelle Park, NJ 07662.

Popular Computing, published by BYTE Publications, Inc., 70 Main St., Peterborough, NH 03458.

Softalk, 11160 McCormick St., North Hollywood, CA 91601.

Softside, 6 South St., Milford, NH 03055.

Table. Addresses of the magazines publishing the software reviews digested in this department.

CALENDAR

Productivity '83 in Philadelphia and Detroit

The Hewlett-Packard Company will present Productivity '83, featuring a wide variety of its computer systems, at Adam's Mark in Philadelphia, PA, April 6–7, and at the Michigan Inn in Detroit, MI, April 19–21.

The show is free and includes seminars and a chance for hands-on experience. For pre-registration or more information, call 800-453-9500.

1983 Eighty/Apple Show in New York

The Kengore Corporation's 1983 version of the Eighty/Apple Show will be held April 8–10 at the Statler Hotel, 7th Ave. and 33rd St., New York City.

This year the show will include the IBM Personal Computer as well as the TRS-80 and the Apple systems. For further information, contact Kengore Corp., 3001 Route 27, Franklin Park, NJ 08823; telephone 201-297-2526.

New Hampshire Conference

A conference titled Computers in Education will be held April 8–9 at the New Hampshire Highway Hotel, in Concord, NH. The conference is sponsored by the New Hampshire Association for Computer Education Statewide in cooperation with the New Hampshire State Department of Education and the Facilitator Center.

Featured will be demonstrations and presentations, a hands-on software laboratory and vendor displays. For further information, call Fernand Prevost at 603-271-3607.

High Tech Meets High Touch

The first conference in the United States to bring together people from the human resource fields ("touchies") and those from computer industry-related areas ("techies") will be held April 12–13 at the Radisson Ferncroft Hotel in Danvers, MA.

Titled The New Technologies: Impacts on People, Organizations and You, the conference will begin a dialogue between those who design office, manufacturing and computer technologies and the human resource professionals who apply these systems. For more information, contact Thomas Chase, 603-862-2018.

APL 83 Conference in Washington, DC

The 1983 APL Conference and Exhibition will be held in Washington, DC, April 10–13 at the Sheraton Washington Hotel. The program will include tutorials, presentation of papers by leaders in the APL field and, of course, the exhibits.

For information on exhibits or program, contact D & S Whyte Associates, 117 King St., Suite 200, Alexandria, VA 22314; telephone 703-548-4059.

Southwest Computer Conference in Oklahoma

April 12–14 are the dates for the Southwest Computer Conference, to be held at the Myriad Convention Center in Oklahoma City, OK. For more information, call 405-329-3660.

Southeastcon '83 in Florida

Southeastcon '83 will take place April 11–14 in the Sheraton Twin Towers Hotel Convention Center in Orlando, FL. The conference is sponsored by Region 3 of the Institute of Electrical and Electronics Engineers (IEEE).

For further information, contact Russell E. Theisen, Martin Marietta Aerospace, PO Box 5837 MP-3, 2667 Fitzhugh Road, Winter Park, FL 32792; telephone 305-671-4139.

National Online Meeting in New York

The fourth National Online Meeting, scheduled for April 12–14 at the Sheraton Centre Hotel in New York City, is devoted to online database searching and other database technology.

The popular feature "Microcomputer Review" will be repeated this year in half-day sessions on April 13th. This review deals with microcomputer applications in the information areas. The phone number for inquiries is 609-654-6266.

FEDERAL DP EXPO in Washington, DC

The new Washington Convention Center will be the site of the ninth annual FEDERAL DP EXPO on April 12–14. There will be displays and demonstrations by more than 150 computer and communications companies.

Forty-six sessions on topics of interest to Federal users will be held. Exhibit-only admission is free to government employees, $10 to others. For information, call The Interface Group, 160 Speen St., Framingham, MA 01701, 800-225-4620 from out of state; from inside Massachusetts, call 617-879-4502.

Applefest in Boston

The third annual Applefest/Boston will be held May 13–15 in Boston's Bayside Exposition Center.

Sponsored by the Boston Computer Society, the show features virtually every Apple-compatible hardware and software product. For more information, call Northeast Expositions, 800-841-7000 from outside Massachusetts, or 617-739-2000 from instate.

Pet User's Conference in Toronto

The second annual Toronto Pet User's Group Conference will be held May 14–15 at the Casa Loma Campus of George Brown College in Toronto.

The Conference will feature disk copy sessions, speakers, Butterfield Machine Language Workshop, exhibitions and a trader's corner. For information, call Chris Bennett, 416-782-9252.

New York Computer Show

The second annual Computer Show and Software Exposition will be held April 14–17 at the Nassau Coliseum on Long Island. The show features thousands of peripheral and software items. Admission is $5 for adults.

For more information, call Northeast Expositions, 617-739-2000 or 800-841-7000.

Applefest/Anaheim

Applefest/Anaheim will be held April 15–17 at the Anaheim, CA., Convention Center. It is the largest Apple-specific show in the country, and virtually all Apple-compatible products will be on display and for sale.

For more information, call Northeast Expositions, 617-739-2000 or 800-841-7000.

New Jersey Computer Festival

The eighth annual Trenton Computer Festival will be held at Trenton State College, just outside Trenton, NJ, on April 16–17. The Festival features many forums, user-group sessions and tutorials—as well as an exhibit and flea market—concentrating on microcomputers.

For more information, call Dr. Allen Katz, 609-771-2487.

Mini/Micro Northeast and Electro/83

The New York Coliseum will be the site of Mini/Micro Northeast and Electro/83, to be held April 19–21 in New York City under the joint sponsorship of IEEE and ERA.

For more information, call Eileen Algaze or Kent Keller, 213-772-2965 or (from outside California) 800-421-6816.

Virginia and Maryland Computer Shows

A Computer Show and Office Equipment Exposition will take place in two locations as follows:

April 21–24 at the Pavilion Exhibition Center, Virginia Beach, VA.

May 19–22 at the Baltimore Convention Center, Baltimore, MD.

For further information on both shows, call Linda Roth, 202-289-4687.

San Diego Pascal Society Meeting

On April 22–24, USUS (the UCSD Pascal User's Society) will hold its semi-annual national meeting at the Hanalei Hotel in San Diego, CA. Non-USUS members are welcome.

In addition to demonstrations and technical presentations, there will be four tutorials: an introduction to the p-System, to UCSD Pascal, to Modula-2 and advanced UCSD Pascal topics. There will also be special-interest meetings for users of IBM PC, Apple, TI and Sage computers. For information on registration, call Winsor Brown, 714-891-6043.

COMDEX/SPRING in Atlanta

The third annual COMDEX/SPRING edition of the world's largest computer industry trade show will be held April 26–29 at the Georgia World Congress Center and Atlanta Apparel Mart in Atlanta, GA.

In addition to displays by more than 600 companies, the Conference will offer 56 sessions on business, marketing and financial subjects. For further information, contact the Interface Group, 160 Speen St., Framingham, MA 01701; telephone 800-225-4620 from out of state or 617-879-4502 from within Massachusetts.

Southwest Computer Show in Dallas

The third annual Southwest Computer Show and Software Exposition will take place April 28–May 1 at the Dallas, TX, Market Hall.

For more information, call Northeast Expositions, 617-739-2000.

Washington DC Educational Conference

Ed-Com '83, the National Computer Conference and Exposition, will be held April 28–30 at the Washington DC Convention Center. It is designed to meet the needs of today's educators and will offer many presentations aimed at all levels of experience.

There will also be exhibits by many hardware, software and publishing companies, and demonstrations of latest innovations in the computer industry. For more information, call Carol Houts, 800-528-2355 from outside Arizona, or 602-990-1715 from within the state.

British Columbia Education Conference

IMPACT 83, a conference for computer-using educators, will take place April 29–30 and May 1 at the University of Victoria, British Columbia.

The Conference, entitled The Impact of Microcomputers in Schools: Myth or Reality? will include displays and will address topics of interest to both the novice and advanced user. For more information and registration materials, contact Tom Lietaer, telephone 604-721-8475.

Two Trade Shows in Canada

May 9–13 are the dates for the National Industrial Production and Machine Tool Show in the Coliseum and Industry Buildings at the CNE in Toronto.

International Computer Show/Salon International de l'Ordinateur will be held May 10–12 in the Velodrome, Olympic Site, Montreal.

For information on both shows, call Jim Steinhart, 416-787-2138.

Two Portland Oregon Conventions

May 10–12 are the dates for Northcon/83 High-Technology Electronics Exhibition and Convention and Mini/Micro Northwest, both to be held concurrently in the Portland, OR Coliseum.

For details, call Eileen Algaze, 213-772-2965.

COMPUTA 83 in Singapore

For readers living in or visiting southeast Asia, the COMPUTA 83 exhibition will take place May 11–15 in Singapore at the World Trade Center.

The exhibition will include a wide spectrum of hardware and software, with systems ranging from micros to mainframes. For details, contact Kallman Associates, 5 Maple Court, Ridgewood, NJ 07450; telephone 201-652-7070.

National Computer Conference In California

The 1983 National Computer Conference will be held May 16–19 in the Anaheim and Disneyland Hotel Convention Centers in Anaheim, CA.

The Conference will include an extensive technical program, professional development seminars and more than 600 exhibits. The various program tracks will address communications, social and computing issues. For more information, call Ann-Marie Bartels, 703-558-3612.

Houston Exposition

The Computer Showcase Expo will be held May 19–22 in Houston, TX. For more information, call The Interface Group, 800-225-4620.

CONVERSIONS

Each month Microcomputing *will publish Apple, Atari, Commodore, Heath or IBM PC translations of selected programs published in the magazine. We encourage our readers to submit a hard copy of their conversions along with a cassette or disk of the program. Include a self-addressed, stamped envelope for the return of magnetic media if not selected for publication. Authors whose translations are chosen will receive payment for their efforts.*

Healthful Hints program (January 1983 Microcomputing*) translated for the TI 99/4A by Bobby Schmidt, 1254 Belmont Drive, Richardson, TX 75080.*

```
10 REM THIS PROGRAM IS INTENDED TO PROVIDE A GUIDE TO HEART DISEASE RISK.
20 REM IT IS ONLY A GUIDE.  CONSULT YOUR PHYSICIAN FOR MORE EXACT INFORMATION.
30 REM ORIGINALLY WRITTEN IN MICROSOFT BASIC BY D.C. SHOEMAKER
40 REM TI 99/4A EXTENDED BASIC TRANSLATION BY BOBBY L. SCHMIDT
50 CALL CLEAR ! CLEARS THE 99/4A SCREEN
60 REM
70 PRINT "This program will help you":"assess your present risk of":"heart disea
se.  It is a"
80 PRINT "guide only; far more exact":"information, you should"
90 PRINT "consult your physician.": :
100 PRINT "To use the program, just":"answer the questions as":"presented."
110 PRINT
120 PRINT "First, age.  Choose from the":"following age group:": :
130 PRINT "  1 - 10 to 20 years old"
140 PRINT "  2 - 21 to 30 years old"
150 PRINT "  3 - 31 to 40 years old"
160 PRINT "  4 - 41 to 50 years old"
170 PRINT "  5 - 51 to 60 years old"
180 PRINT "  6 - 61 and over": :
190 DISPLAY AT(24,1):"What is your AGE category?"
200 ACCEPT AT(24,28)VALIDATE("123456")BEEP SIZE(1):A
210 IF A=5 THEN A=A+1
220 IF A=6 THEN A=A+2
230 CALL CLEAR
240 PRINT "Next is the heredity factor.":"Select from the following:": :
250 PRINT "1 - NO known history of":"     heart disease in the":"     family."
260 PRINT "2 - ONE relative with":"     cardiovascular disease,":"     over 60."
270 PRINT "3 - TWO relatives with":"     cardiovascular disease,":"     over 60.
"
280 PRINT "4 - ONE relative with":"     cardiovascular disease,":"     under 60.
"
290 PRINT "5 - TWO relatives with":"     cardiovascular disease,":"     under 60
."
300 PRINT "6 - THREE relatives,":"     under 60.": : :
310 DISPLAY AT(24,1):"What category (1-6) ?"
320 ACCEPT AT(24,25)VALIDATE("123456")BEEP SIZE(1):H
330 IF H=5 THEN H=H+1
340 IF H=6 THEN H=H+1
350 CALL CLEAR
360 PRINT "Now for your weight.  Choose":" from the following:": :
370 PRINT "1 - more than 5 pounds under":"     standard weight for":"     your h
eight."
390 PRINT "2 - between -5 and +5 of":"     the standard."
400 PRINT "3 - 6 to 20 pounds":"     overweight."
410 PRINT "4 - 21 to 35 pounds":"     overweight."
420 PRINT "5 - 36 to 50 pounds":"     overweight."
430 PRINT "6 - more than 51 pounds":"     overweight.": : :
440 DISPLAY AT(24,1):"Which category (1-6) ?"
450 ACCEPT AT(24,25)VALIDATE("123456")BEEP SIZE(1):W
460 W=W-1
470 IF W=4 THEN W=W+2
480 IF W=5 THEN W=W+2
490 CALL CLEAR
500 PRINT "Smoking habits are next.":" Select from the following":" groups.": :
510 PRINT :"1 - non-smoker."
520 PRINT :"2 - cigar and/or pipe."
530 PRINT :"3 - 10 or fewer cigarettes":"     per day."
540 PRINT :"4 - 20 cigarettes a day."
550 PRINT :"5 - 30 cigarettes a day."
560 PRINT :"6 - 40 or more cigarettes":"     a day.": : : :
570 DISPLAY AT(24,1):"What's your category (1-6)?": : :
580 ACCEPT AT(24,28)VALIDATE("123456")BEEP SIZE(1):T
590 T=T-1
600 IF T=3 THEN T=T+1
610 IF T=4 THEN T=T+2
620 IF T=5 THEN T=T+5
630 CALL CLEAR
640 PRINT "Now for your exercise":"patterns.  Choose from:": :
650 PRINT "1 - intensive occupational":"     and recreational":"     exertion."
660 PRINT "2 - moderate occupational":"     and recreational":"     exercise."
670 PRINT "3 - sedentary work and ":"     intense recreational":"     exercise."
680 PRINT "4 - sedentary occupational":"     and moderate":"     recreational ex
ercise."
700 PRINT "5 - sedentary work and":"     light recreational":"     exercise."
710 PRINT "6 - complete lack of":"     all exercise.": : :
720 DISPLAY AT(24,1):"Which category (1-6) ?"
730 ACCEPT AT(24,25)VALIDATE("123456")BEEP SIZE(1):E
740 IF E=4 THEN E=E+1
750 IF E=5 THEN E=E+1
760 IF E=6 THEN E=E+2
770 CALL CLEAR
780 PRINT "The amount of cholesterol or":"fat per cent in your diet is":"next.
You may choose from":"the following:"
800 PRINT "1 - cholesterol below 180":"     mg.%; diet contains no":"     animal
 or solid fats."
820 PRINT "2 - cholesterol 181-205":"     mg.%; diet contains 10%":"     animal
or solid fats."
840 PRINT "3 - cholesterol 206-230":"     mg.%; diet contains 20%":"     animal
or solid fats."
860 PRINT "4 - cholesterol 231-255":"     mg.%; diet contains 30%":"     animal
or solid fats."
880 PRINT "5 - cholesterol 256-280":"     mg.%; diet contains 40%":"     animal
or solid fats."
900 PRINT "6 - cholesterol 281-300":"     mg.%; diet contains 50%":"     animal
or solid fats.": :
920 DISPLAY AT(24,1):"Which category (1-6) ?"
930 ACCEPT AT(24,25)VALIDATE("123456")BEEP SIZE(1):C
940 IF C=6 THEN C=C+1
950 CALL CLEAR
960 PRINT "Now for your blood pressure.":"Select from the following:": : :
970 PRINT "1 - upper reading of 100."
980 PRINT :"2 - upper reading of 120."
990 PRINT :"3 - upper reading of 140."
1000 PRINT :"4 - upper reading of 160."
1010 PRINT :"5 - upper reading of 180."
1020 PRINT :"6 - upper reading of 200":"     or over.": : :
1030 DISPLAY AT(24,1):"Which category (1-6) ?"
```

More

Listing continued.

```
1040 ACCEPT AT(24,25)VALIDATE("123456")BEEP SIZE(1):P
1050 IF P=5 THEN P=P+1
1060 IF P=6 THEN P=P+2
1070 CALL CLEAR
1080 PRINT "Finally, your sex.  Choose":"from the following:": : : :
1090 PRINT "1 - female under age 40."
1100 PRINT :"2 - female of age 40 to 50."
1110 PRINT :"3 - female over 50."
1120 PRINT :"4 - male."
1130 PRINT :"5 - stocky male."
1140 PRINT :"6 - bald, stocky male.": : :
1150 DISPLAY AT(24,1):"Find your category (1-6) ?"
1155 ACCEPT AT(24,28)VALIDATE("123456")BEEP SIZE(1):S
1160 IF S=4 THEN S=S+1
1170 IF S=5 THEN S=S+1
1180 IF S=6 THEN S=S+1
1190 REM
1200 REM TALLY THE FACTORS
1210 REM
1220 GT=A+H+W+T+E+C+P+S
1230 CALL CLEAR
1240 PRINT "  Results of this short quiz":"suggest that, based on your"
1250 PRINT "answers to the questions, in":"light of currently accepted"
1260 PRINT "standards, your risk of":"suffering a heart attack is"
1270 REM
1280 REM DETERMINE THE APPROPRIATE RESPONSE
1290 REM
1300 IF GT>40 THEN 1360
1310 IF GT>31 THEN 1380
1320 IF GT>24 THEN 1390
1330 IF GT>17 THEN 1400
1340 IF GT>11 THEN 1410
1350 GOTO 1420
1360 PRINT "at a dangerous and urgent":"level.  You should see your"
1370 PRINT "physician now." :: GOTO 1430
1380 PRINT "at a dangerous level." :: GOTO 1430
1390 PRINT "moderate." :: GOTO 1430
1400 PRINT "generally below average." :: GOTO 1430
1410 PRINT "below average." :: GOTO 1430
1420 PRINT "well below average."
1430 PRINT : : : :"press <enter> to continue"
1435 CALL KEY(0,K,S):: IF S=0 THEN 1435
1436 IF K<>13 THEN 1435 ELSE CALL CLEAR
1440 PRINT "You should bear in mind that":"this simple analysis of your":"risk f
actors reflect medical"
1450 PRINT "conditions and habits":"associated with an increased"
1460 PRINT "danger of heart attack.  It":"neither means that you will"
1470 PRINT "or won't suffer one, but":"merely suggests potentials.":"Not all fac
tors can be"
1480 PRINT "quantified this simply and":"easily.": :
1490 PRINT "You should be guided in":"this, as in all matters of":"health, by co
mpetent medical"
1500 PRINT "advice.  This computer":"program is not a substitute"
1520 PRINT "for that."
```

Healthful Hints program converted for the Commodore microcomputing systems by Jose Luis Arriola, 1036 Aquamarine Lane, Corona, CA 91720.

```
10 REM THIS PROGRAM IS INTENDED TO PROVIDE A GUIDE TO HEART DISEASE RISK
20 REM IT IS ONLY A GUIDE.  CONSULT YOUR PHYSICIAN FOR MORE EXACT INFORMATION
30 REM WRITTEN IN MICROSOFT 'BASIC' BY D.C. SHOEMAKER
40 REM CONVERTED TO COMMODORE 8032 BY J.L. ARRIOLA
50 PRINT"■":REM CLEAR SCREEN
70 PRINT"THIS PROGRAM WILL HELP YOU ASSESS YOUR PRESENT RISK TO HEART"
80 PRINT"DISEASE.  IT IS A GUIDE ONLY; FOR MORE EXACT INFORMATION , YOU"
90 PRINT"SHOULD CONSULT YOUR PHYSICIAN.":PRINT
100 PRINT"TO USE THE PROGRAM, JUST ANSWER THE QUESTIONS AS PRESENTED."
110 PRINT
120 PRINT"FIRST, AGE.  CHOOSE FROM THE FOLLOWING AGE GROUPS:":PRINT
130 PRINT"1 - TEN TO TWENTY YEARS OLD"
140 PRINT"2 - TWENTY ONE TO THIRTY YEARS OLD"
150 PRINT"3 - THIRTY ONE TO FORTY YEARS OLD"
160 PRINT"4 - FORTY ONE TO FIFTY YEARS OLD"
170 PRINT"5 - FIFTY ONE TO SIXTY YEARS OLD"
180 PRINT"6 - SIXTY ONE AND OVER":PRINT
190 PRINT:INPUT"WHAT IS YOUR AGE CATEGORY (1-6)";A
200 IF A<1 OR A>6THEN 110
210 IF A=5 THEN A=A+1
220 IF A=6 THEN A=A+2
230 PRINT"■"
240 PRINT"NEXT IS THE HEREDITY FACTOR.  SELECT FROM THE FOLLOWING:":PRINT
250 PRINT"1 - NO KNOWN HISTORY OF HEART DISEASE IN THE FAMILY"
260 PRINT"2 - ONE RELATIVE WITH CARDIOVASCULAR DISEASE, OVER SIXTY"
270 PRINT"3 - TWO RELATIVES WITH CARDIOVASCULAR DISEASE, OVER SIXTY"
280 PRINT"4 - ONE RELATIVE WITH CARDIOVASCULAR DISEASE, UNDER SIXTY"
290 PRINT"5 - TWO RELATIVES WITH CARDIOVASCULAR DISEASE, UNDER SIXTY"
300 PRINT"6 - THREE RELATIVES, UNDER SIXTY":PRINT
310 PRINT:INPUT"WHAT CATEGORY (1-6)";H
320 IF H<1 OR H>6 THEN 230
330 IF H=5 THEN H=H+1
340 IF H=6 THEN H=H+1
350 PRINT:PRINT
360 PRINT"NOW FOR YOUR WEIGHT.  CHOOSE FROM THE FOLLOWING:":PRINT
370 PRINT"1 - MORE THAN 5 POUNDS UNDER THE STANDARD WEIGHT"
380 PRINT"    FOR YUOR HEIGHT"
390 PRINT"2 - BETWEEN -5 AND +5 POUNDS OF THE STANDARD"
400 PRINT"3 - 6 TO 20 POUNDS OVERWEIGHT"
410 PRINT"4 - 21 TO 35 POUNDS OVERWEIGHT"
420 PRINT"5 - 36 TO 50 POUNDS OVERWEIGHT"
430 PRINT"6 - MORE THAN 51 POUNDS OVERWEIGHT":PRINT
440 PRINT:INPUT"WHICH CATEGORY (1-6)";W
450 IF W<1 OR W>6 THEN 350
460 W=W-1
470 IF W=4 THEN W=W+2
480 IF W=5 THEN W=W+2
490 PRINT"■"
500 PRINT"SMOKING HABITS ARE NEXT.  SELECT FROM THE FOLLOWING GROUPS:":PRINT
510 PRINT"1 - NON-SMOKER"
520 PRINT"2 - CIGAR AND/OR PIPE"
530 PRINT"3 - 10 OR FEWER CIGARETTES PER DAY"
540 PRINT"4 - 20 CIGARETTES A DAY"
550 PRINT"5 - 30 CIGARETTES A DAY"
560 PRINT"6 - 40 OR MORE CIGARETTES A DAY":PRINT
570 PRINT:INPUT"WHAT IS YOUR CATEGORY (1-6)";T
580 IF T<1 OR T>6 THEN 490
590 T=T-1
600 IF T=3 THEN T=T+1
610 IF T=4 THEN T=T+2
620 IF T=5 THEN T=T+5
630 PRINT:PRINT
640 PRINT"NOW FOR YOUR EXERCISE PATTERNS.  CHOOSE FROM:":PRINT
```

More

Listing continued.

```
650 PRINT"1 - INTENSIVE OCCUPATIONAL AND RECREATIONAL EXERTION"
660 PRINT"2 - MODERATE OCCUPATIONAL AND RECREATIONAL EXERCISE"
670 PRINT"3 - SEDENTARY WORK AND INTENSE RECREATIONAL EXERCISE"
680 PRINT"4 - SEDENTARY OCCUPATIONAL AND MODERATE RECREATIONAL"
690 PRINT"    EXERCISE"
700 PRINT"5 - SEDENTARY WORK AND LIGHT RECREATIONAL EXERCISE"
710 PRINT"6 - COMPLETE LACK OF ALL EXERCISE":PRINT
720 PRINT:INPUT"WHICH CATEGORY (1-6)";E
730 IF E<1 OR E>6 THEN 630
740 IF E=4 THEN E=E+1
750 IF E=5 THEN E=E+1
760 IF E=6 THEN E=E+2
770 PRINT"□"
780 PRINT"THE AMOUNT OF CHOLESTEROL OR FAT PER CENT IN YOUR DIET IS NEXT."
790 PRINT"YOU MAY CHOOSE FROM THE FOLLOWING:":PRINT
800 PRINT"1 - CHOLESTEROL BELOW 180 MG.%; DIET CONTAINS NO ANIMAL"
810 PRINT"    OR SOLID FATS"
820 PRINT"2 - CHOLESTEROL 181-205 MG.%; DIET CONTAINS 10% ANIMAL"
830 PRINT"    OR SOLID FATS"
840 PRINT"3 - CHOLESTEROL 206-230 MG.%; DIET CONTAINS 20% ANIMAL"
850 PRINT"    OR SOLID FATS"
860 PRINT"4 - CHOLESTEROL 231-255 MG.%; DIET CONTAINS 30% ANIMAL"
870 PRINT"    OR SOLID FATS"
880 PRINT"5 - CHOLESTEROL 256-280 MG.%; DIET CONTAINS 40% ANIMAL"
890 PRINT"    OR SOLID FATS"
900 PRINT"6 - CHOLESTEROL 281-300 MG.%; DIET CONTAINS 50% ANIMAL"
910 PRINT"    OR SOLID FATS"
920 PRINT:INPUT"WHAT CATEGORY (1-6)";C
930 IF C<1 OR C>6 THEN 770
940 IF C=6 THEN C=C+1
950 PRINT"□"
960 PRINT"NOW FOR YOUR BLOOD PRESSURE. SELECT FROM THE FOLLOWING":PRINT
970 PRINT"1 - UPPER READING OF 100"
980 PRINT"2 - UPPER READING OF 120"
990 PRINT"3 - UPPER READING OF 140"
1000 PRINT"4 - UPPER READING OF 160"
1010 PRINT"5 - UPPER READING OF 180"
1020 PRINT"6 - UPPER READING OF 200 OR OVER":PRINT
1030 PRINT:INPUT"WHICH CATEGORY (1-6)";P
1040 IF P<1 OR P>6 THEN 950
1050 IF P=5 THEN P=P+1
1060 IF P=6 THEN P=P+2
1070 PRINT:PRINT
1080 PRINT"FINALLY YOUR SEX. CHOOSE FROM THE FOLLOWING:":PRINT
1090 PRINT"1 - FEMALE UNDER AGE 40"
1100 PRINT"2 - FEMALE OF AGE 40 TO 50"
1110 PRINT"3 - FEMALE OVER 50"
1120 PRINT"4 - MALE"
1130 PRINT"5 - STOCKY MALE"
1140 PRINT"6 - BALD, STOCKY MALE":PRINT
1150 PRINT:INPUT"AND YOUR CATEGORY (1-6)";S
1160 IF S=4 THEN S=S+1
1170 IF S=5 THEN S=S+1
1180 IF S=6 THEN S=S+1
1190 REM
1200 REM TALLY THE FACTORS
1210 REM
1220 GT=A+H+W+T+E+C+P+S
1230 PRINT"□"
1240 PRINT"RESULTS OF THE SHORT QUIZ SUGGEST THAT, BASED ON YOUR"
1250 PRINT"ANSWERS TO THE QUESTIONS, IN LIGHT OF CURRENTLY ACCEPTED"
1260 PRINT"STANDARDS, YOUR RISK OF SUFFERING A HEART ATTACK IS"
1270 REM
1280 REM DETERMINE THE APPROPRIATE RESPONSE
1290 REM
1300 IF GT>40 THEN 1360
1310 IF GT>31 THEN 1380
1320 IF GT>24 THEN 1390
1330 IF GT>17 THEN 1400
1340 IF GT>11 THEN 1410
1350 GOTO 1420
1360 PRINT"AT A DANGEROUS AND URGENT LEVEL.  YOU SHOULD SEE YOUR"
1370 PRINT"PFYSICIAN NOW.":GOTO 1430
1380 PRINT"AT A DANGEROUS LEVEL.":GOTO 1430
1390 PRINT"MODERATE":GOTO 1430
1400 PRINT"GENERALLY BELOW AVERAGE.":GOTO 1430
1410 PRINT"BELOW AVERAGE.":GOTO 1430
1420 PRINT"WELL BELOW AVERAGE."
1430 PRINT:PRINT
1440 PRINT"YOU SHOULD BEAR IN MIND THAT THIS SIMPLE ANALYSIS OF YOUR RISK"
1450 PRINT"FACTORS REFLECT MEDICAL CONDITIONS AND HABITS ASSOCIATED WITH"
1460 PRINT"AN INCREASED DANGER OF HEART ATTACK.  IT NEITHER MEANS THAT YOU"
1470 PRINT"WILL OR WON'T SUFFER ONE, BUT MERELY SUGGESTS POTENTIALS.  NOT"
1480 PRINT"ALL FACTORS CAN BE QUANTIFIED THIS SIMPLY AND EASILY.":PRINT
1490 PRINT"YOU SHOULD BE GUIDED IN THIS, AS IN ALL MATTERS OF HEALTH, BY"
1500 PRINT"COMPETENT MEDICAL ADVICE.  THIS COMPUTER PROGRAM IS NOT A"
1510 PRINT"SUBSTITUTE FOR THAT."
1520 END
READY.
```

R Is for Red program (February 1983 Microcomputing*) converted by Ralph Sprang (c/o* Microcomputing*) to run on the Apple II+.*

```
 5  REM  CONVERSION BY RALPH SPRANG
 15  REM  ORIGINAL PROGRAM PUBLISHED IN THE
 16  REM  FEB 1983 MICROCOMPUTING
 100  REM  "R" IS FOR RED
 110  HOME
 120  GR : REM  TURN ON GRAPHICS
 130  DIM TURN(255),SKILL(3),NUMBER(255)
 140  REM  LOCATE CURSOR
 160  REM  CHOOSE SKILL LEVEL
 170  PRINT "SKILL LEVEL (1-5)?"
 180  REM  READ KEYBOARD
 200  GET SKILL
 220  REM  SET SPEED OF DISPLAY
 230  IF SKILL = 1 THEN SKILL = 150
 240  IF SKILL = 2 THEN SKILL = 100
 250  IF SKILL = 3 THEN SKILL = 50
 260  IF SKILL = 4 THEN SKILL = 25
 270  IF SKILL = 5 THEN SKILL = 10
 280  REM  GET FIRST COLOR
 290  GOTO 640
 300 COUNT = 0: REM  RESET COUNTER
 310  REM  LOOP TO DO EACH COLOR
 320  FOR I = 1 TO NUMBER
 330  REM DISPLAY EACH COLOR
 340  IF TURN(COUNT) = 0 THEN  GOSUB 720
 350  ON TURN(COUNT) GOSUB 780,840,900
 380  REM  INCREMENT EACH TIME
 390 COUNT = COUNT + 1
 400  REM  DO NEXT COLOR
 410  NEXT I
 440 COUNT = 0
 450  REM  FIRST TIME THROUGH IS 1
 460  IF NUMBER < 1 THEN NUMBER = 1
 470  FOR K = 1 TO NUMBER
 480  REM  READ KEYBOARD
```

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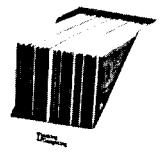

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Listing continued.

```
490  GET GUESS$:GUESS =  ASC (GUESS$): IF GUESS > 127 THEN GUESS = GUESS -
     127
500  REM  KEEP TRACK OF TIMES THROUGH
510 ANSWER = TURN(COUNT)
520  REM  TRANSLATE ANSWER
530  IF ANSWER = 0 THEN ANSWER = 82
540  IF ANSWER = 1 THEN ANSWER = 66
550  IF ANSWER = 2 THEN ANSWER = 71
560  IF ANSWER = 3 THEN ANSWER = 89
570  REM  MATCH PATTERN AGAINST PLAYER RESPONSE
580  IF GUESS <  > ANSWER THEN 970
590 COUNT = COUNT + 1
600  NEXT K
620 NUMBER = NUMBER + 1
630  REM  CHOOSE RANDOM COLOR
640 HUE =  INT (4 *  RND (1))
650  REM  SAVE COUNT IN NUMBER
660 COUNT = NUMBER
670  IF COUNT = 0 THEN COUNT = 1
680  REM  LABEL EACH COLOR IN SEQUENCE
690 TURN(COUNT) = HUE
700  REM  DO IT AGAIN
710  GOTO 300
720  COLOR= 11: VLIN 0,30 AT 0
730  REM  MAKE SOUND
740  FOR J = 1 TO SKILL:Z% =  PEEK ( - 16336): NEXT
760  COLOR= 0: VLIN 0,30 AT 0
770  RETURN
780  COLOR= 6: VLIN 0,30 AT 0
790  REM  MAKE SOUND
800  FOR J = 1 TO SKILL / 1.5:Z% =  PEEK ( - 16336): FOR Z = 1 TO 2: NEXT
     : NEXT
820  COLOR= 0: VLIN 0,30 AT 0
830  RETURN
840  COLOR= 4: VLIN 0,30 AT 0
850  REM  MAKE SOUND
860  FOR J = 1 TO SKILL / 1.75:Z% =  PEEK ( - 16336): FOR Z = 1 TO 3: NEXT
     : NEXT
880  COLOR= 0: VLIN 0,30 AT 0
890  RETURN
900  COLOR= 13: VLIN 0,30 AT 0
910  REM  MAKE SOUND
920  FOR J = 1 TO SKILL / 2:Z% =  PEEK ( - 16336): FOR Z = 1 TO 4: NEXT : NEXT
940  COLOR= 0: VLIN 0,30 AT 0
950  RETURN
960  PRINT "ERROR": GOTO 240
970  REM  MISTAKE ROUTINE
990  REM  BLUNDER SOUND
1000  PRINT  CHR$ (7), CHR$ (7), CHR$ (7)
1050  REM  CLEAR ALL VARIABLES TO ZERO
1060  REM  THEN BEGIN AGAIN
1070  CLEAR : GOTO 130
```

Program conversion of the R Is for Red program for the Commodore-64. Translated by Gary McClellan, WizardWorks, PO Box 1750, Flagstaff, AZ 86002.

```
 50 REM ************************************
 51 REM *      "R" IS FOR RED GAME         *
 52 REM *   MICROCOMPUTING, FEBRUARY 1983  *
 53 REM *       BY TIMOTHY P. BANSE        *
 54 REM *                                  *
 55 REM *   CONVERTED FROM THE ATARI TO    *
 56 REM *     COMMODORE 64 VERSION BY      *
 57 REM *         GARY D. MCCLELLAN        *
 58 REM ************************************
 60 PRINTCHR$(147):PRINT"      ###  'R' IS FOR RED GAME  ###":PRINT
 70 PRINT"MATCH THE COLOR/SOUND SEQUENCE GENERATED BY THE COMPUTER-"
 80 PRINT:PRINTCHR$(28);"      'R' KEY = RED"
 82 PRINTCHR$(31);"      'B' KEY = BLUE"
 84 PRINTCHR$(30);"      'G' KEY = GREEN"
 86 PRINTCHR$(158);"      'Y' KEY = YELLOW"
 88 PRINT:PRINTCHR$(144);"PUSH ANY KEY TO START-"
 90 GET0$:IF0$=""THEN90:REM WAIT FOR START
101 POKE53281,15:POKE53280,15
102 FORX=54272TO54296:POKEX,0:NEXT:REM CLEAR SOUND CHIP
104 WA=54276:REM WAVEFORM
105 AD=54277:SR=54278:REM ATTACK/DECAY & SUSTAIN/RELEASE
106 NL=54272:NH=54273:REM LOW FREQ AND HIGH FREQ OF NOTE
107 POKE54296,15:REM SET VOLUME AT HIGH
110 PRINTCHR$(147);:REM CLEAR SCREEN
120 GOSUB1080:REM DRAW COLOR BASE
130 DIMTU(255),SK(255),NU(255)
160 REM CHOOSE SKILL LEVEL
170 PRINT"PLEASE ENTER SKILL LEVEL ( KEYS 1 TO 5 )";CHR$(145);
180 GETS$:IFS$=""THEN180
185 IFASC(S$)<49ORASC(S$)>53THENGOTO170
200 HS=PEEK(704)*10:REM HIGH SCORE
210 PRINTCHR$(147)"SKILL LEVEL= ";S$,"HIGH SCORE =";HS
220 REM SET SPEED OF DISPLAY
230 IFS$="1"THEN DE= 160
240 IFS$="2"THEN DE= 125
250 IFS$="3"THEN DE= 80
260 IFS$="4"THEN DE= 40
270 IFS$="5"THEN DE= 20
285 FORX=0TO7:POKEV+39+X,15:NEXT:REM DISAPPEAR SPRITE COLOR BARS
290 GOTO640:REM GET FIRST COLOR
300 CT=0:REM RESET COUNTER
320 FORI=1TO NB
340 IFTU(CT)=0THENGOSUB720
350 IFTU(CT)=1THENGOSUB780
360 IFTU(CT)=2THENGOSUB840
370 IFTU(CT)=3THENGOSUB900
390 CT=CT+1
410 NEXTI
420 REM GET KEY FROM KEYBOARD
440 CT=0
450 REM FIRST TIME THROUGH IS 1
460 IF NB<1THENNB=1
470 FORK=1TONB
490 GETA$:IFA$=""THEN490
510 AN=TU(CT)
530 IFA$="R"THENRE=0
540 IFA$="B"THENRE=1
550 IFA$="G"THENRE=2
560 IFA$="Y"THENRE=3
580 IFRE<>ANTHEN970
590 CT=CT+1
595 IFSC<CTTHENSC=CT:REM UPDATE SCORE
596 PRINT"SCORE= ";SC*10:PRINTCHR$(145);
600 NEXTK
620 NB=NB+1
```

More →

Listing continued.

```
640 CO=INT(RND(0)*4)
660 CT=NB
670 IFCT=OTHENCT=1
690 TU(CT)=CO
710 GOTO300
720 POKEV+39,2:POKEV+43,2:POKE53280,2: REM RED COLOR BAR AND BORDER
730 POKEAD,88:POKESR,195:POKENL,216:POKENH,12:POKEWA,33:REM SOUND
740 FORJ=1TODE:NEXTJ
750 POKEAD,0:POKEWA,0:POKENL,0:POKENH,0
760 POKEV+39,15:POKEV+43,15:POKE53280,15
770 RETURN
780 POKEV+40,6:POKEV+44,6:POKE53280,6:     REM BLUE COLOR BAR AND BORDER
790 POKEAD,88:POKESR,195:POKENL,37:POKENH,17:POKEWA,33:REM SOUND
800 FORJ=1TODE:NEXTJ
810 POKEAD,0:POKEWA,0:POKENL,0:POKENH,0
820 POKEV+40,15:POKEV+44,15:POKE53280,15
830 RETURN
840 POKEV+41,5:POKEV+45,5:POKE53280,5: REM YELLOW COLOR BAR AND BORDER
850 POKEAD,88:POKESR,195:POKENL,63:POKENH,19:POKEWA,33:REM SOUND
860 FORJ=1TODE:NEXTJ
870 POKEAD,0:POKEWA,0:POKENL,0:POKENH,0
880 POKEV+41,15:POKEV+45,15:POKE53280,15
890 RETURN
900 POKEV+42,7:POKEV+46,7:POKE53280,7: REM GREEN COLOR BAR AND BORDER
910 POKEAD,88:POKESR,195:POKENL,154:POKENH,21:POKEWA,33:REM SOUND
920 FORJ=1TODE:NEXTJ
930 POKEAD,0:POKEWA,0:POKENL,0:POKENH,0
940 POKEV+42,15:POKEV+46,15:POKE53280,15
950 RETURN
970 REM BLUNDER
975 POKEV+21,0
980 POKEAD,88:POKESR,195:POKENL,16 :POKENH,6  :POKEWA,33:REM SOUND
985 REM PYROTECHNICS, ETC.
990 FORJ=15TO0STEP-1:POKE53280,J:POKE53281,15-J:FORI=1TO50:NEXTI:NEXTJ
995 POKEAD,0:POKEWA,0:POKENL,0:POKENH,0
1000 IFSC>PEEK(704)THENPOKE704,SC:REM UPDATE HIGH SCORE
1010 CLR:GOTO101:REM RESTART THE GAME
1080 REM SET UP SPRITE DATA BLOCK, 8 BITS WIDE,21 BITS DOWN
1100 FORX=0TO62:POKE832+X,255:NEXT
1110 FORX=0TO7:REM SET EIGHT SPRITE POINTERS TO DATA BLOCK
1120 POKE2040+X,13
1130 NEXT
1140 V=53248:REM START OF VIDIO IC
1150 FORX=1TO7STEP2:REM SET UP Y COORDINATES OF SPRITES
1160 POKEV+X,100:POKEV+X+8,142
1170 NEXTX
1180 POKEV+23,255:REM SET ALL SPRITES TO EXPANDED Y MODE (42 BITS DOWN)
1190 FORX=0TO4STEP2:REM SET UP X COORDINATE FOR EACH PAIR OF SPRITES
1200 POKEV+X,70+X*34 :POKEV+X+8,70+X*34
1210 NEXT:POKEV+6,20:POKEV+14,20:POKEV+16,128+8
1300 POKEV+39,2:POKEV+43,2:REM RED
1310 POKEV+40,6:POKEV+44,6:REM BLUE
1320 POKEV+41,5:POKEV+45,5:REM GREEN
1330 POKEV+42,7:POKEV+46,7:REM YELLOW
1400 POKEV+21,255:REM TURN ON ALL SPRITES
1500 RETURN
READY.
```


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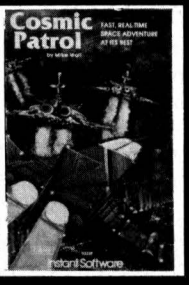

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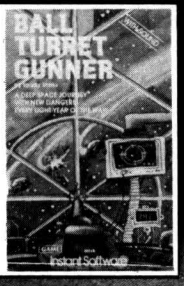

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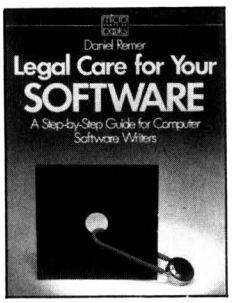
A Collection of Pascal Translations

Legal Care for Your Software (A Step-by-Step Guide for Computer Software Writers)

Daniel Remer
Addison-Wesley, 1982
Reading, MA 01867
Softcover, 247 pp., $19.95

I truly enjoy "how-to" books. Where else can you learn to be an expert plumber in ten easy lessons, or to find the secret of slimming your waistline—using meditation?

How-to-ism has pervaded every part of our lives. Well, just about every part; brain surgery for the do-it-yourselfer still may be a few years away. But we do already have books that tell you how to write your own will, and, closer to home, books that tell even the complete idiot how to write computer programs.



Enter *Legal Care for Your Software*, a how-to legal book aimed at programmers and publishers.

After witnessing the demise of my automobile engine due to some well-meaning but incorrect how-to advice, I couldn't help but wonder if *Legal Care for Your Software* gives the straight scoop.

It was comforting to find out that the author is an attorney and has more than a passing interest in the software business, and that he enlisted the help of several legal specialists. If one expert is good, then three or four must be better.

But just as there is more than one way to tune a carburetor, there is more than one way to interpret the law. In translating specifics into generalities, *Legal Care* occasionally falls into the how-to trap of making sweeping statements.

Nothing is wrong with using generalities as a means of illustrating broad points, but, as any student of introductory law will tell you, it is the exception rather than the rule that you're tested on. Take the example of the author's statement that a contract (I assume a written one) "must be signed by all parties." It just isn't so . . . change the word "must" to "should" and you'll have a much more reasonable (and correct), albeit general, statement.

Admittedly, this kind of slipup is rare in *Legal Care*, but it underscores the importance of taking a general rather than a specific interpretation of knowledge that is translated from expert to how-to form.

With accuracy out of the way, my next concern was completeness. Does *Legal Care* cover the subject adequately or does it do as other books have done—leave you hanging midway between rebuilding the engine and overhauling the transmission?

In one sense, *Legal Care* is complete, touching on trade secrets, copyright, contracts, trademarks, patents and warranties. But such a comprehensive approach almost eliminates the possibility of any single topic receiving exhaustive coverage. You end up with 150 pages of overviews and 90 pages of tear-out contracts.

Legal Care's strongest feature is its lucidness. Numerous fictitious examples are employed to illustrate concepts. This makes for a great teaching tool but a not-so-great legal reference.

Besides being a tutorial, *Legal Care* serves as a cookbook. Just tear out a contract, fill in the appropriate blanks and you're in business.

I wish it were that simple. In reality, an established publisher will already have a contract of his own. And if you do manage to stick to the basic form of one of the book's contracts, changes and additions could still send you scurrying to a lawyer. Give me a recipe and I'll change it; the take-them-as-they-come approach of tear-out contracts doesn't appeal to me. But they do make helpful checklists for drawing up your own.

No lawyer, let alone any book, can eliminate piracy of your software. Recent court cases have shown that computer law is still in its infancy. But while lawyers are sorting things out, you can still take all sorts of reasonable precautions to avoid getting ripped off.

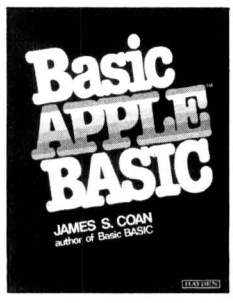
If you're not sure where you stand, *Legal Care* makes an above-average starting point. How-to books haven't put plumbers or mechanics out of business, and I doubt that *Legal Care for Your Software* will eliminate the need for lawyers. But isn't it nice to have an edge?

Timothy Daniel
Oxford, OH

Basic Apple Basic

James S. Coan
Hayden Book Company, Inc., 1982
50 Essex St.
Rochelle Park, NJ 07662
Softcover, 237 pp., $12.95

I normally work with Apple IIIs, but occasionally I find myself wanting to write programs for the Apple II, using the Apple III in emulation mode. It's easier said than done, though—especially when what little you know about Applesoft has been gleaned from magazine articles and listings.



I found the answer in a local bookstore, when the attractive cover of *Basic Apple Basic* caught my eye. A quick glance through the book convinced me that it contained the information I wanted.

Basic Apple Basic contains material on both Integer Basic and Applesoft Basic. And author James Coan has provided more than just a list of Basic commands;

his book teaches programming skills and would serve as an excellent textbook for beginners' computing classes.

To illustrate the application of the various commands, the book contains more than 80 distinct programs. Summaries and review questions are provided with each chapter.

A unique feature of *Basic Apple Basic* is the inclusion of a "Programmer's Corner" after each chapter to emphasize special features or to present advanced techniques. In addition to being well-indexed, the book employs boldface type in headings that introduce each of the Basic keywords; this makes it easy to use as a reference.

Basic Apple Basic surprised me in that it contains a nicely written chapter on DOS, as well as a discussion of sequential and random-access files. These topics are often omitted in comparably priced books on Applesoft.

Another pleasant surprise was the chapter on hi-res graphics. It contains a fine discussion of shape tables and should be helpful to the beginner aspiring to write game programs.

The appendixes are also helpful. One appendix provides a guide to peeks, pokes and calls that are valuable for advanced programming. Another appendix includes answers to even-numbered questions in each chapter.

I heartily recommend this book both for users of the Apple III who wish to program for the II and for Apple II users who wish to learn Basic programming.

Justin Crom
Denver, CO

Micro Cookbook Vol. 1, Fundamentals

Don Lancaster
Howard W. Sams & Co., 1982
4300 West 62nd St.
PO Box 7092
Indianapolis, IN 46206
Softcover, 381 pp., $15.95

Don Lancaster's books are landmarks in the field of making digital electronics understandable; they're clearly written, with readable discussions that emphasize a hands-on approach. *Micro Cookbook* is no exception.

This book is a sound introduction to microcomputer hardware and software. Lancaster's approach is simple: Most available micros have common features and uses; if the basics are understood, details of specific microprocessors can easily be picked up.

Lancaster assumes little background from the reader; he attempts to build a working knowledge of important concepts himself. Work and play are not separated; everything run on a computer is a game. Learning is enjoyable, and results are obtained with what is available—not with what must be purchased.

Microcomputer hardware is introduced by showing what it can do. Key words are defined in boxes, and Lancaster provides examples and humorous illustrations.

The second chapter is an important one; Lancaster provides a set of realistic guidelines to help readers become microcomputer literates. These common-sense ideas are spelled out in few—if any—introductory books.

One piece of Lancaster's advice is particularly important—explore and develop what you really want to learn. The rest will follow.

In order to develop what you want to learn, some resources are necessary. Lancaster describes the important ones, including computer magazines (*Microcomputing* is one of his favorites), trade journals, personal resource files, free literature, computer stores and mail order dealers. This section alone makes the book worth its price.

Another important chapter, "Funny Numbers," presents number systems used in micros and necessary hardware and software logic. Lancaster describes binary and hexadecimal numbers and arithmetic operations in a way the reader will easily understand.

A chapter on computer codes presents those codes actually used on micros—not esoteric ones found only in textbooks. The book shows how codes perform useful operations in the micro. The discussion of 2's complement is one of the easiest to understand I've seen in print.

The last chapter deals with computer memory. It provides simple examples, descriptions of available memory chips (ICs) and flip-flops.

Since this is the first book in a series, it appears to stop in mid-air. Still, it represents an exceptional value, whether it's by itself or part of a series.

Dennis Doonan
Racine, WI

Practical Pascal Programs

Basic programs converted to
Pascal by Greg Davidson
Osborne/McGraw-Hill, 1982
2600 Tenth St.
Berkeley, CA 94710
Softcover, 205 pp., $15.99

Practical Pascal Programs provides a strong argument for browsing.

Before buying this book, take a look at the programs that are included. For some people, the programs will be a helpful second step into the delights of Pascal programming; they're definitely not written in an introductory style. For others, the programs will seem like a waste of money.

The programs presented in this book are straightforward translations from *Practical Basic Programs*, written by Lon Poole and published two years ago by Osborne/McGraw-Hill. Like all good translations, these aren't word-for-word conversions; instead, they're substantially modified to make use of special features of Pascal—for example, Case statements and Include files.

As pointed out in the introduction, a conservative Pascal was used to write the programs in this book, so they should be readily adapted to almost any implementation of the language. Users of UCSD or LazyIO Pascal get a bonus in the form of specific input/output routines, which are provided with these two versions of the language.

Once you've determined that the programs will run on your system, what can you do with them? All sorts of things—the areas covered by the 40 programs listed in the table of contents include financial planning, income tax calculations, management decisions, mathematical computations, statistical computations and transpositions to and from one musical key to another.

Some of the programs are rather short and simple, but others take advantage of the facility with which large and complex programs can be handled in Pascal.

If you've just finished learning how to use Pascal on your Apple (with the Luehrman/Peckham *Hands-On Approach*, for example), *Practical Pascal Programs* is an excellent book to use in taking the next step in writing programs. It could be especially enlightening for people who think microcomputers are useful primarily for playing games.

Practical Pascal Programs sets itself a rather restricted set of goals, but it meets these goals. It doesn't attempt to present a detailed theoretical basis for the algorithms used, and the programs vary a bit in the amount of explanatory comment provided within them. But each program is accompanied by an example of its use, practice problems (with answers) and references that presumably give some of the theoretical basis for the algorithm employed.

The programs I tried worked on my first attempts. The listings appear to be direct printouts of the programs, thus avoiding typesetting errors, but this approach can have some shortcomings if the wrong printer is used.

Indeed, this is my most serious criticism of the book. The dot-matrix listings in my copy of the book are faint; it was tiresome to squint at them while entering longer programs. (I find it hard to understand why a publisher like McGraw-Hill couldn't have found a better solution to this problem; my MX-80 gives much clearer printouts than those in this book.)

All told, though, this set of Pascal programs is potentially useful for a number of people. It's definitely worth it to spend a few minutes with *Practical Pascal Programs* to see if it can help you.

James Florini
Syracuse, NY

Create and Calculate

Graph 'N' Calc, from Desktop Computer Software (303 Potrero St. 29/303, Santa Cruz, CA 95060), is designed to be a low-cost business graphics system with an advanced calculation facility, offering both the novice and experienced computer user a potent decision support and display tool.

Graph 'N' Calc provides advanced statistical and financial functions like multiple linear regressions, net present value, internal rate of return and exponential smoothing.

Because the IBM PC supports high-resolution graphics, you can use Graph 'N' Calc to make detailed line charts, side-by-side and stacked-bar charts, and high/low/close/volume stock-market charts. You can also make a variety of labeled pie charts from Graph 'N' Calc or DIF (Data Interchange Format) files.

The user interface to the program was designed to be simplistic and flexible. All commands are menu-driven and entered with a single keystroke. Graph 'N' Calc lets you accelerate data input with extensive current value defaults. These defaults assume numerical values common to many financial models.

Graph 'N' Calc can be used with any single-drive IBM PC computer system with 64K RAM, a monochrome or RGB color monitor, Epson MX-series dot-matrix printer with the Graftrax option or Hewlett-Packard two-pen color-pen graphics plotter, and an optional Davong Systems hard disk drive. The package costs $199. Reader Service number 460.

Keeping Track of Drugs

RXWriter is a prescription-writing program designed for physicians. It permits you to prepare six prescriptions at a time. The prescriptions are printed in duplicate, one for the patient and another for the clinical record.

RXWriter creates a disk file which contains the name, date, diagnosis and prescription abbreviations. The file can be searched to find, for example, all the patients who were prescribed a specific drug.

Included in the system are utilities for adding, deleting or modifying drugs in the drug file and a help routine which looks up the information in the physician's list of drugs. The system uses abbreviations which are similar to the Latin abbreviations physicians are used to writing.

Among the advantages of RXWriter over handwritten prescriptions are the legibility of the final prescriptions, speed of writing, prevention of errors in prescription writing and retention of both a printed copy and a disk file of prescriptions.

RXWriter requires CP/M and 48K. It is available in standard eight-inch CP/M format as well as a variety of other CP/M formats. It costs $50 and is manufactured by Hall Design, 250 Maple Ave., Wilmette, IL 60091. Reader Service number 476.

Apple Software

Howard W. Sams & Co., Inc. (4300 W. 62nd St., PO Box 7092, Indianapolis, IN 46206), has released four software products for the Apple II with 48K and one disk drive. The programs are Music Games, Financial Facts, Money Tools and Instant Recall.

Music Games are designed to master the art of music. It incorporates 12 menu-driven programs. Topics include movement on a staff, recognition of notes and rhythm, measures and musical pitches. Color graphics and sound reproduction aid sight and sound recognition of musical notes and rhythms. Music Games incorporate programs for all age groups. It sells for $39.95.

Financial Facts is a group of 18 mathematical programs designed to figure and print out reports for various loan, savings and investment plans. Included in the package are programs covering depreciation, future value, interest rates, loans, payments, investments, deposits and withdrawal values. It sells for $59.95.

Money Tools is a home or small business financial record keeping and reporting system. The system keeps records of income, expenses and checkbook balances and reconciliations. Budgets may be created to help guide spending within a given period of time. One-hundred-and-twenty budget areas can be created for 12 recording periods. Five hundred transactions can be handled per period. It costs $59.95.

Instant Recall is a data handler that is designed to let you create screens full of information, up to 840 characters per screen, and change the information with sophisticated editing features. The information can be saved in computer memory or on disk. Files can be loaded from disk in less than five seconds. Once loaded, information can be shuffled around in memory, allowing you to scan for a particular record, search for the one or two numbers or words you are interested in, and display and print this information out. Instant Recall sells for $59.95. Reader Service number 467.

VIC-20 Word Processing

Wordcraft 20 is a word processing program for the Commodore VIC-20 computer. The program comes as a permanent ROM cartridge and is designed to create perfect documents, letters and personalized form letters. It can create and print out mailing lists and other special-purpose projects.

Special functions of Wordcraft include ruler scale across the top of the screen; automatic centering; adding, inserting or merging text; status display; print function while display is on; deleting character, word, line, paragraph and block; multicolumn indents; saving or storing on disk or cassette; print features such as underscore, boldface and multiple copies; justification; footnotes; variable page length; nonprint comments; tabbing; expandable system memory; screen color selection; mailing-list program; disk formatting; search and replace; force new page; nondestructive directory; personalized documents; and encrypted output.

The Wordcraft system has a page capacity of 99 characters by 66 lines. It offers text highlighting, decimal tabs, hard and soft hyphens. Up to 40 pages can be stored on disk or tape.

Wordcraft 20 is compatible with any printer—serial or parallel. The documentation comes with a demo text tape complete with personal and business examples. It is available from United Microware Industries, Inc., 3503C Temple Ave., Pomona, CA 91768. Reader Service number 468.

Sports Software

Midwest Software (Box 214, Farmington, MI 48024) has announced two sports-related software packages for Commodore computers. The programs are called Football Scout and Basketball Stats.

Football Scout is designed to let football coaches keep all scouting information on a rival team's offense and print that information in three well-organized reports. The program costs $79.50 and requires a Commodore computer with 32K, any disk drive and CBM or ASCII printer.

Basketball Stats keeps up to 15 statistical facts on up to 18 players for up to 30 games per season. The statistics are then printed in reports which summarize the entire game. Basketball Stats costs $39.50 and requires a Commodore com-

puter with 16K or 32K, a single or dual 4040 drive and CBM or ASCII printer.

Demo disks of both Football Scout and Basketball Stats are available for $5. It is refundable. Reader Service number 473.

Timberline Spreadsheet

Timberline Systems, Inc. (10550 SW Allen Blvd., Beaverton, OR 97005), has released Timberline Spreadsheet, the first of the company's Medallion Collection.

Timberline Spreadsheet is designed to reduce the time needed to develop accurate forecasts and business projections. It simplifies budget adjustments and lets management see immediate results of "what-if" situations.

The program features a wide array of statistical calculation capabilities. Six conditional statements are available for developing reports based on changing financial parameters, allowing almost any set of conditions to be entered into the spreadsheet in an "if. . .then" format. Timberline Spreadsheet also calculates more sophisticated equations such as Net Present Value and Internal Rate of Return. .

Timberline Spreadsheet calculates linear regression (a technique to understand the linear relationship between seemingly unrelated data points). Additional statistical calculations such as correlation coefficients, dependent variable, analysis independent variable, analysis calculation slope, standard deviation and variance are included in the software. All calculations are made in real-time. As new figures are keyed into the system, calculation results are displayed instantly.

The software features a double-sided display that allows the user to view two separate areas within the worksheet simultaneously. The editing function allows sophisticated editing based on user-definable commands. Rows and columns can be inserted, deleted or moved with simple commands.

The Timberline Spreadsheet package runs on hardware compatible with the UCSD-p-System. It also requires 64K of system memory and a minimum of two floppy disk drives. Systems supporting these requirements include the Apple III, the DEC Professional and Rainbow computers, the IBM Displaywriter, the Osborne I, the Texas Instruments Business System 200 and Home Computer.

The package costs $395. Reader Service number 472.

Two IBM Programs

IBM (System Products Division, Entry Systems, PO Box 1328, Boca Raton, FL 33432) has announced two programs for its Personal Computer. The IBM Personal Computer Home Budget Program is designed to extend home applications, and the Basic Primer introduces users to the Basic programming language.

The IBM PC Home Budget Program provides ledger capability for home finances without the need for accounting experience. Monthly spendable income can be allocated into as many as 48 separate categories. These categories include charge accounts, savings accounts, food, auto expenses and utilities.

Daily expenses can be entered into the system and a complete expense history is automatically recorded. Budget status information is available at any time on a month-to-date and year-to-date basis. About 2500 entries may be recorded on a single-sided disk using a one-drive system. This gives the average user more than one year's worth of budget tracking. The Home Budget Program costs $60.

The Basic Primer is an educational workbook presented on screen. Simple interactive exercises introduce the editing power of the PC's keyboard. The concepts are frequently reviewed and gradually become more difficult.

The Basic Primer combines keyboard practice with simple programming exercises. Simple words and pictures make the program ideal for teaching Basic to young students. It costs $60.

Both the IBM PC Home Budget Program and the Basic Primer require 80-column display capability. Reader Service number 470.

Computer to Printer

Form Writer is designed to allow you to improve communication between your computer and printer. It was developed for use with the IBM Personal Computer and Diablo 630 printer. The program is a combination database management/mail merge/word processing package on one disk.

If you have been having trouble getting your Diablo printer going faster than 300 baud on a serial cable, Form Writer sends at 9600 baud. If you have been trying to find a set of programs to let you send out the same letter to several hundred names and addresses, Form Writer will let you selectively batch those names from your master file of names. The word processor utilizes the word processing capabilities built into the Diablo 630—so the intelligence of the printer isn't wasted.

The PC's function keys are used for on/off keys for underlining, right justification, bold printing and centering, but the printer does the work. Unlike most word processors which are designed for multipage manuscripts, Form Writer is designed for a myriad of forms, short notes and letters.

Form Writer costs $275. It is available from Business Development International, Box 329, Third & Rollette, Pembina, ND 58271. Reader Service number 461.

Manipulating Text

Wordplan, from DEA Software (PO Box 968, 198 Lloyd Ave., Fremont, CA 94537), is a text and data formatting package that allows you to easily manipulate textual and numeric values within documents containing variable information (such as material costs or names).

Wordplan is designed to act as a VisiCalc for documents, solving business problems where the numbers are calculated values and both numbers and text change frequently. It is well-suited for proposals, price lists, form letters and other applications where text and numbers are involved.

Wordplan lets you set up

Form Writer from Business Development International.

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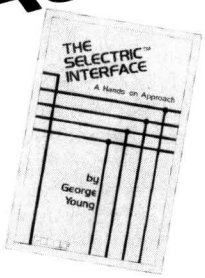

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your template documents and embed the necessary variables and equations. Then all you have to do is change one variable to change all of the associated equations and variables. Wordplan accepts text from any text editor and you can take existing documents and modify them to accept text and numbers to meet your specific needs.

Wordplan is available in the following CP/M formats: Apple, Xerox, Zenith, Televideo, NorthStar, Osborne, Hewlett-Packard, SuperBrain and eight-inch IBM single-sided soft-sector disks. IBM Personal Computer support and other formats will be available shortly. The package costs $195. The manual can be purchased for $35. Reader Service number 475.

Don't Touch That Disk

Meddle Pruf is designed to prevent disks used in the classroom from being tampered with or pirated. The program, designed for the Apple II with 48K Applesoft, allows a teacher to protect each student disk with two levels of security: disk encoding and a unique password.

Files may not be exchanged from one student disk to another, even if the password is known. However, with a master disk, a teacher can view, write to and copy from any student disk. Meddle Pruf features over 3900 possible protection combinations.

The Meddle Pruf disk and documentation can be obtained from Microcomputer Workshops Corp., 103 Puritan Drive, Port Chester, NY 10573 for $59.95. Reader Service number 474.

Generating Programs

Data Transport Systems, Inc. (347 East 62nd St., New York, NY 10021), has released a program generator for the IBM Personal Computer and the Apple II. The generator, called PC Create, writes Basic programs to maintain a random-access file built according to the user's specifications. The user specifications are captured on a screen.

PC Create features the availability of the highly structured source code in Basic, allowing users to add their own application modules with minimal effort. There are built-in empty modules to which application writers could add.

PC Create requires an IBM PC with 64K and one disk drive or an Apple II with 48K and one disk drive. The software will operate under IBM DOS, Apple DOS or CP/M DOS. Reader Service number 465.

Clearing Things Up

Wind/X is a machine-language utility program that allows programmers to instantly clear an entire screen, a line or a designated window of its current contents.

The program can be used to quickly clear screens, or parts of the screen of text, in order to quickly rewrite the screen with new material. The routine is useful for users of the IBM green-screen display, because the program can instantly clear text or figures from the screen. The routine can be called from Basic with speed in excess of 200 times the equivalent Basic language routines. The Wind/X utility may be used, under license, in user-developed applications packages.

Wind/X's documentation is designed to let both the experienced and novice applications developer use the routine without extensive analysis of the underlying assembly-language code. The package comes with a documented demonstration program, a technical description of how the application works and a detailed explanation of how to use the routine in the user's Basic program.

The utility includes both a source and executable version for programmers to use directly or as part of another assembly-language program.

Wind/X is available from Boardroom Executive Software (Suite 240, Airport Park Plaza, 255 North El Cielo Road, Palm Springs, CA 92262) for $40. The application requires a 32K IBM Personal Computer, single disk drive and 80-column screen. Reader Service number 464.

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Newton, MA

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Dealers: Listings are **$15** per month in prepaid quarterly payments, or one yearly payment of **$150**, also prepaid. Ads include 25 words describing your products and services plus your company name, address and phone. (No area codes or merchandise prices, please.) Call Marcia at 603-924-9471 or write *Microcomputing*, Ad Department, Peterborough, NH 03458.

Sneak Previews

In May, *Microcomputing* will focus on memory storage—and particularly on Winchester hard disks. The feature article will explain how to interface a Winchester system with an Apple and an SS50 computer system.

Another article will take you behind the scenes for a look at the manufacturing of hard disks, and another will outline the techniques of handling virtual memory. In addition, *Microcomputing* will publish a buyer's guide on a multitude of hard disk systems currently on the market.

Part two of Jim Hansen's review of the Epson QX-10 also will be included in our May issue. Hansen will cover the software systems—including Valdocs—that are used with the QX-10.

Another note of interest: the May issue will see the birth of Frank Derfler's new column— a spin-off from his long-running "Dial-up Directory."

In the June *Microcomputing*, we'll take a look at how micros are used in the banking industry. One article and program we'll be publishing will help you beat the high costs of home mortgage. If you're planning to buy or sell a house, this article will aid that process by detailing creative finance methods.

We'll also feature a financial edit and report program. You'll be able to get the most out of your home budget with this menu-driven program, which takes up about 60 sectors of disk space.

CLUB NOTES

New York Amateur Computer Club

The New York Amateur Computer Club is a non-profit group that catalogs and distributes public domain software. It has just published the fourth book of its catalog.

For more details, write the Club at PO Box 106, Church St. Station, New York, NY 10008, or call Susan Perricone at 212-243-0325.

Wisconsin IBM PC User's Group

The Madison, WI, IBM PC User's Group is seeking more contact with other systems' user's groups in the local area.

For information, contact Philip Niehoff, PO Box 83, Madison, WI 53701.

Florida CP/M Group

The CP/M Computer Group, located in southeast Florida, meets at 7 p.m. the first and third Thursdays of each month on the second floor of the Tamarac Pharmacy, 4959 North State Road 7, Tamarac, FL 33319.

For more information, write Jack George, 1501 S.E. 14th St., Deerfield Beach, FL 33441.

SW Connecticut IBM PC Club

The IBM PC Users Club of Fairfield County, CT, meets on the fourth Tuesday of each month at 6 p.m. in the Darien Public Library.

For more information, write or call Davis Foulger, 69 River Road, New Canaan, CT 06840; 203-966-9378.

Long Island IBM Group

The IBM PC Users Group of the Long Island Computer Association meets the second Friday of every month at the New York Institute of Technology, Commack campus, in Room 10.

For time of the meetings or other information, contact Marvin Friefeld, 3 Lyndron Ave., Smithtown, NY 11787; 516-724-0574.

CLASSIFIEDS

Classified advertisements are intended for use by persons desiring to buy, sell or trade used computer equipment. No commercial ads are accepted.

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Heath 32K H8, serial & par. I/O, cass. & disk intfc, ext. config. opt. (for CP/M), W/W card, ext. card, H9 term., ASR33 hdcpy term, $1100; 2 ea. 12-15V, 20A pwr sup., cond. unk. but repairable, $25 ea.; Ballentine 320 True RMS AC voltmeter, $25; Conrac 9 in. video mon., $35; Tektronix RM35 o'scope, $250: David L. Marshall, 1803 Scenic Drive, Alamogordo, NM 88310; 505-437-6374.

H-89 with 48K, 5-inch disk, cassette interface, HDOS, BH Basic, like new, incl. manuals—$1300. Gene Floersch, 5723 Portland, Mpls, MN 55417. Phone 612-853-4782 (ofc), 612-824-4245 (home).

Used Heath H-8, S-100 BUS, and Wang Laboratories computer for sale. Memory board, I/O card, terminal, disk drive, software and complete system. Ten to 50 percent off list price. Send for free listing. D. Wong, Box 406, Croton Falls, NY 10519.

Wanted: New or used INTERACT-R and/or INTERACT-R hardware or software. Contact Dr. H.S. Frank, 817-573-8943 (home), 817-599-7131 (office) or write to: 904 S. Main St., Weatherford, TX 76086.

Classified Ads Get Results!

Lisa

The Lisa system, from Apple Computer, Inc., is designed to forge a new relationship between users and computers, allowing people to work in a more natural way without having to adopt rigid computer conventions or special languages.

Lisa's screen displays simple pictures of documents, folders and other familar things in a typical office. A palm-size "mouse" is used to point to and manipulate these items, and to perform desired tasks.

Lisa is powered by the MC68000, a 32/16-bit microprocessor that has the capability to combine software, display, keyboard, mouse and peripherals into a versatile system. The system is configured with one megabyte of main memory and 1.7 megabytes (formatted) of built-in mass storage on two 5¼-inch floppy disk drives.

Lisa also features a 12-inch, black-on-white, bit-mapped screen. This high-resolution screen displays 364 lines of 720 dots each.

The system includes one megabyte of read/write memory and two built-in floppy disk drives, a five megabyte ProFile and six integrated applications programs. The system costs $9995. Reader Service number 482.

The Timex-Sinclair 2000 personal computer features high-resolution graphics in eight colors, fully-programmable sound, a moving key and typewriter-format keyboard. It is available in both 16K and 48K versions. Also in the photo is the TS-2040 thermal printer, which features a 32-column width and quiet operation at a speed of two lines per second.

Timex-Sinclair 2000

Timex Computer Corporation will manufacture and market a 48K RAM personal computer that sells for $199.95. The Timex-Sinclair 2000 will feature hi-res color graphics, programmable sound and a movable, typewriter-format keyboard.

The Timex-Sinclair 2000 is a redesigned and enhanced version of the Sinclair ZX Spectrum personal computer which is manufactured by Timex for Sinclair Research, Ltd., and is available outside the U.S. and Canada.

The TS-2000 has a range of eight colors and allows separate control for foreground, background and border areas, as well as a flash command and brightness control. The computer has a display area of 24 lines with 32 characters each. Hi-res graphics are provided by 256 dots horizontally and 192 dots vertically—all individually addressable by the user.

TS-2000 is 9 1/8×5 5/8×1 1/4 inches and weighs 20 ounces. The computer will be packaged complete with all power, TV and cassette recorder connections, and a step-by-step instruction manual.

A 16K model of the TS-2000 is available for $149.95. Timex Computer Corporation, PO Box 2655, Waterbury, CT 06725. Reader Service number 487.

A Computer for All Needs

Panasonic (One Panasonic Way, Secaucus, NJ 07094) has entered the home-computer market with the release of the JR-200.

The JR-200 is a color computer designed to meet virtually all home-computing needs. The computer features a built-in ac power supply, a built-in RF modulator, a built-in connection for a cassette player, printer interface and connections for Atari-compatible joysticks.

The JR-200 has 32K of useable RAM and 16K ROM. The Basic language is built into the computer's ROM.

The JR-200 can be connected to most television sets or a RGB-type monitor. I can be attached to any standard cassette player that has a remote jack.

The JR-200 is capable of generating eight colors simultaneously and three simultaneous tones in five octaves for music composition or sound effects.

The Panasonic computer also features a multifunction keyboard arranged in standard typewriter configuration, allowing the user to type not only numbers and letters in upper- and lowercase, but also Basic commands and

Lisa is a 32/16-bit personal computer from Apple Computer, Inc., and is designed to revolutionize the way work is done in the office environment.

The JR-200, from Panasonic, is a 32K RAM (16K ROM) color computer designed to meet all home-computing needs.

Intelligent Serial I/O Processor Board Now Available

The GIMIX Intelligent Three-port RS-232C Serial I/O Interface can significantly increase throughput of a multi-user system by reducing the number of interrupts between user terminals and the host CPU. The Intelligent I/O Board accomplishes this by buffering data transfers between system and users and preprocessing of the data.

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S-30 Interface/Programmer/Baseplate/Cable $375.00
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DEALER INQUIRIES WELCOME

The Atari 1200XL features 64K, 12 user-programmable function keys and built-in diagnostics.

semigraphics symbols as well. The computer sells for $399.95. Reader Service number 490.

Atari's New System

Atari has announced the release of the Atari 1200XL home computer. The computer features a number of built-in functions and is compatible with Atari's existing family of computer software and peripherals.

The Atari 1200XL's keyboard includes 12 user-programmable function keys designed to simplify the use of the keyboard. The operations implemented by these keys include the following:

- The ability to shift the keyboard into a European character set (from regular graphics set), including special symbols for currency and grammar.
- The ability to disable the operation of the keyboard to assure that as programs are being run they aren't interrupted by the accidental touch of a key.
- The ability to turn off the screen to preserve the quality of the monitor when the computer is left on and unattended for extended periods.

The Atari 1200XL incorporates a number of design improvements:

- The program cartridge slot has been shifted to the side of the computer. Also, there are no longer doors to open and close, making the cartridge easier to insert.
- Two additional lights on the computer indicate whether the specific functions of the locking keyboard and European character set are in use.
- One-touch cursor controls to streamline cursor movement.
- A spectrum of 256 colors available for display on the monitor as well as four distinct sound voices covering 3½ octaves on the computer's built-in speaker.
- Two controller ports to use with the same joysticks and paddles as well as with numerical keypads.

The Atari 1200XL will retail for $899. Atari Incorporated, 1265 Borregas Ave., PO Box 427, Sunnyvale, CA 94086. Reader Service number 488.

Commodore Communicates

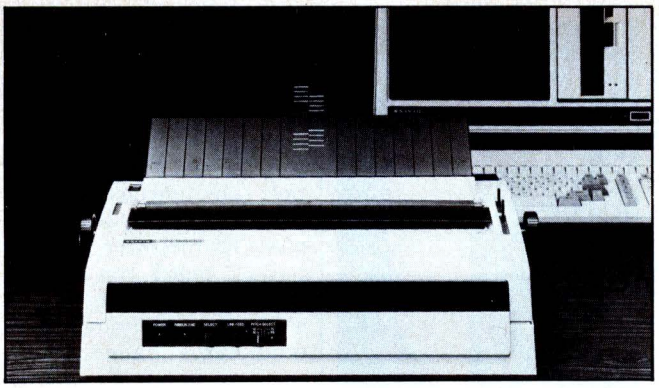
Human Engineered Software (2275 East Bayshore Road, Palo Alto, CA 94303-3269) has released the HES Modem I for the Commodore-64 and VIC-20 computers.

The direct-connect HES Modem I ties a C-64 or VIC-20 to other computers via telephone lines with emulator software developed by Midwest Micro. The modem has a baud rate selectable to 300.

The HES Modem I sells for $79.95. Reader Service number 486.

Timex Printer

Timex Computer Corporation has announced the release of a 32-column thermal printer for its Timex-Sinclair 1000/2000 computers. The printer incorporates a dot-matrix mechanism with full graphics and text capability, and operates at a speed of two lines per second.



The PR5500 is a 16 cps daisy-wheel printer from Sanyo Business Systems Corporation.

The full-function design of the TS-2040 printer features two modes: full-screen printing with single key copy command, as well as a program-controlled printing mode that allows custom control of the printing format.

The TS-2040 connects to any Timex computer and features simple on/off controls incorporated in a specially-designed housing for quiet operation.

The printer costs $99.95. Timex Computer Corporation, PO Box 2655, Waterbury, CT 06725. Reader Service number 489.

Sanyo 16 cps Daisy-Wheel Printer

Sanyo Business Systems Corporation (51 Joseph St., Moonachie, NJ 07074) has announced the release of a 16 cps daisy-wheel printer. The printer, called the Model PR5500, features adjustable typing pitch and bidirectional printing. It will handle 17-inch paper.

The PR5500's minute horizontal (1/120 inch) and vertical (1/48 inch) movements allow a wide range of printing functions. The printer has boldface, subscript, superscript, double strike, underline and microjustification to interface with software.

The PR5500 is compatible with most word processors and any computer with a centronics parallel interface. It costs $995. Reader Service number 481.

Toshiba Letter Quality Printer

The P1350 LetterPerfect printer, from Toshiba America, Inc. (Information Systems Division, 2441 Michelle Drive, Tustin, CA 92680), combines output capabilities for word and data processing with high-resolution graphics.

The printer operates at 100 characters per second for letter-quality word processing output. It runs at 160 cps for draft-quality data processing requirements and 192 cps for

The P1350 LetterPerfect printer from Toshiba combines output capabilities for word and data processing with high-resolution graphics.

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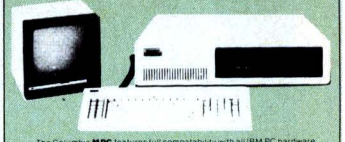

The Columbia **MPC** features full compatability with all IBM PC hardware and software, including MSDOS, MSBASIC, CP/M-86, FORTRAN, PASCAL, COBOL, CBASIC 86, etc. Comes with 128K RAM, two double-sided drives (320K per drive), two serial ports, one parallel port, and a keyboard port.

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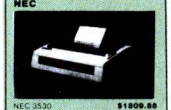

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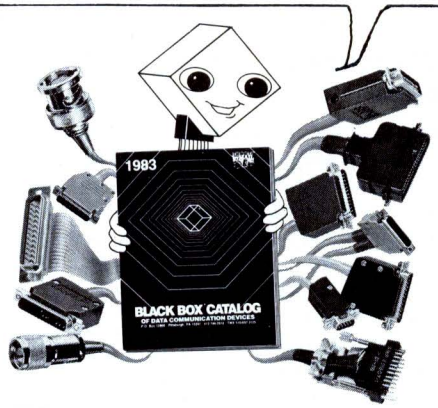

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The Compact Computer 40, from Texas Instruments, is a small cordless computer designed for professionals.

graphics creation.

The P1350 has a 132-column matrix unit which features a 24-wire (individually replaceable) print head, plus a Centronics-compatible interface or the optional RS-232C serial hookup.

The P1350 uses a single-pass and overlapping dot technique to achieve speeds nearly double those of daisy-wheel printers.

In addition to Toshiba products, the P1350 is compatible with IBM, Apple, DEC and other popular microcomputers and word processors. It sells for $2195. Reader Service number 492.

The TI Compact Computer

Texas Instruments, Inc. (PO Box 10508, Lubbock, TX 79408), has released the Compact Computer 40 (CC-40). The computer has an integrated LCD display, is programmable in enhanced Basic and can run preprogrammed applications software loaded either from plug-in solid state cartridges or from small tape cartridges.

The system is battery operated and fits on a desk or into a briefcase. It is designed to be used as a small personal cordless computer and for data communications. Its small size and battery operation also provide extensive capability for portable computer applications.

The Basic language built into the CC-40 is compatible with TI Basic used in TI's other home computers. Calculator functions are available through immediate equation evaluation.

The CC-40 contains 6K of user-addressable RAM. It can be expanded to 16K. The computer costs $249.95. Reader Service number 495.

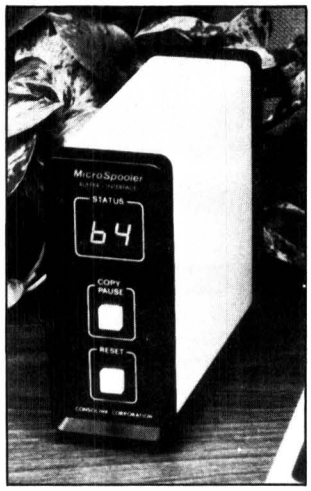
Securing the IBM

The Computer Escort, from FMJ, Inc. (PO Box 5281, Torrance, CA 90510), is designed to provide security, organization and convenience for the IBM Personal Computer.

The unit is constructed of steel with a textured finish color which matches the IBM PC. The basic components of the Computer Escort are a low-profile bottom-shelf unit that allows storage of the IBM keyboard behind a locked door, a bottom removable adhesion plate to secure the unit to a table top, a removable adhesion plate for securing the computer and a removable rear cover for providing storage of excess cables and accessories.

The Power Sentry option includes transient suppression with 4 ac outlets controlled by a key switch. Security brackets protect the plug-in cards inside the IBM by restricting removal of the computer's cover.

The Computer Escort costs $155. Reader Service number 484.



Consolink's MicroSpooler is a simple, compact buffer that is designed to help eliminate lag-time between a home computer, a terminal and a printer.

Printer Buffer

MicroSpooler is a small, self-contained box that is a buffer between a home computer, a terminal and a printer. It is designed to solve the downtime problem caused by lag between calling up a job and obtaining hard copy. MicroSpooler holds the called-for information until your printer is ready to accept it, freeing the terminal for other uses.

The unit features 16K of memory, factory or user-expandable to 32K or 64K; multiple copy functions—just by pushing a button on the face of the MicroSpooler, up to 99 printed copies can be produced; pause—if you wish to stop output, printing can be temporarily halted at the touch of a button; internal power supply—because MicroSpooler contains its own power supply it can be plugged into a wall socket and will retain data independently of a terminal's power supply; independently selectable baud rates for serial applications; and other features.

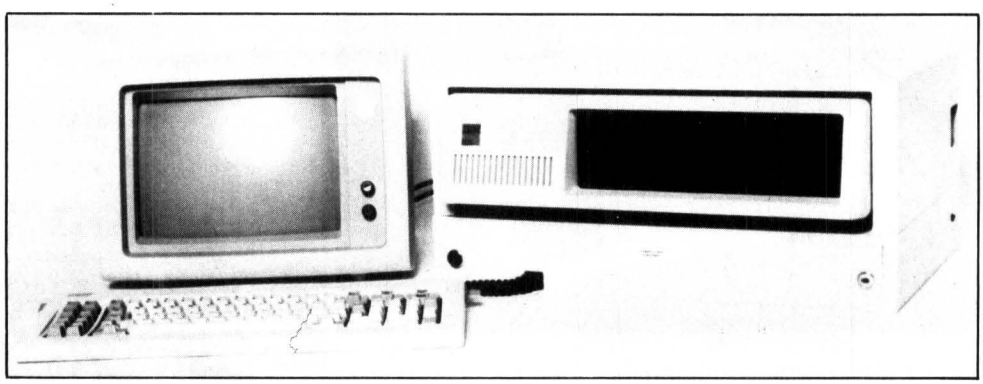
MicroSpooler is available from Consolink Corporation, 1840 Industrial Circle, Longmont, CO 80501. It costs $199. Reader Service number 496.

Apple II Upgraded

The Apple IIe, from Apple Computer, Inc. (20525 Mariani Ave., Cupertino, CA 95014), is an upgraded version of the Apple II personal computer.

The Apple IIe features 64K of RAM (expandable with an additional 64K, upper- and lowercase characters and an expanded keyboard. The system offers improved logic board and case design and will accept a low-cost 80-column card for text editing.

Designed for use in Germany, France and the United Kingdom, the Apple IIe uses the International Standards Organization (ISO) keyboard layout and has local-language character sets and American



The Computer Escort, from FMJ, Inc., provides security and improves the convenience and organization of the IBM Personal Computer.

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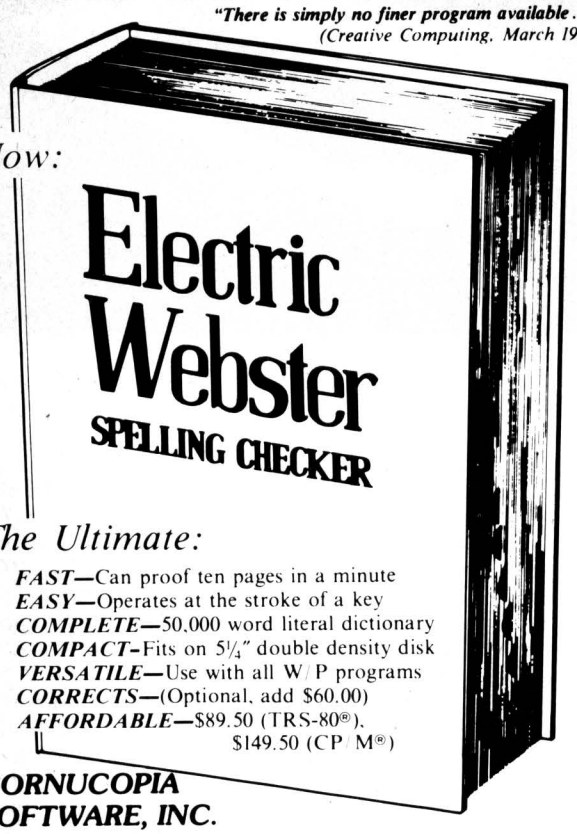

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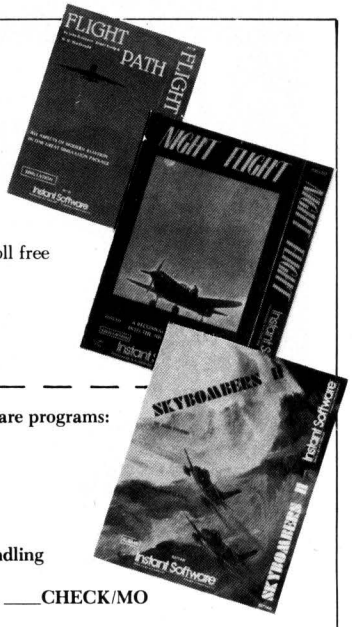

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The Apple IIe, from Apple Computer, Inc., provides 64K of random access memory (expandable with an additional 64K), an upper- and lowercase alphabet, low-cost 80-column-add-in capability and eight expansion slots.

The Pied Piper I is a CP/M-based computer designed for serious business and engineering applications.

characters on the same keys. An easily accessible switch allows the use of either character set at any time. The owner's manual is available in German and French.

The Apple IIe is priced at $1395. Apple will also offer a complete "Starter System" package which includes the Apple IIe computer with 64K of memory, the Disk II floppy disk drive with controller card, a 12-inch monitor with stand, and the Apple 80-column card. The price of this Starter System is $1995. Reader Service number 483.

CP/M-Based Computer

The Pied Piper I, from STM Electronics Corporation (525 Middlefield Road, Suite 130, Menlo Park, CA 94025), is a full-featured, fully-expandable, lightweight system designed for serious business and engineering applications.

The Pied Piper I has 64K, weighs less than 15 pounds and comes with a full ASCII keyboard. It is built around the Z-80A microprocessor and has an integral 256K byte slim-line minifloppy mass-storage unit and provides a connector for a second floppy. A five or ten megabyte hard-disk subsystem may also be added.

The computer has full capabilities for terminal emulation. Optional hardware and software that allows direct access via modem to the Source, Datapac and Dow Jones Information Retrieval databases will be available.

For video display, the system can interface a standard CRT monitor providing a 24-line by 80-character screen format. An RF modulator is also included; this allows data to be displayed on

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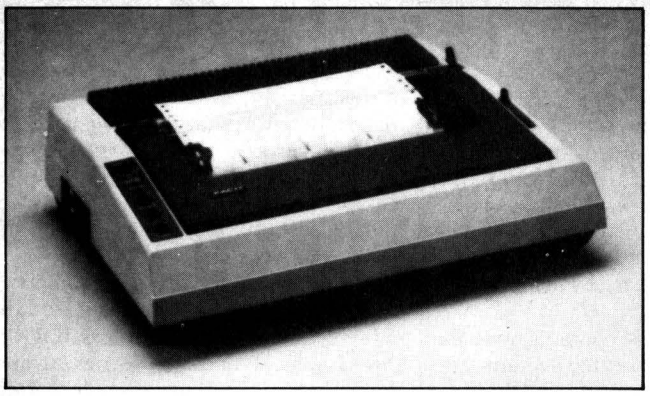


The 4510 dot-matrix printer from Facit/Dataroyal.

a regular television set.

The Pied Piper has two free card slots for expansion boards. The computer sells for $1299. Reader Service number 491.

Facit/Dataroyal Dot-Matrix Printer

Facit/Dataroyal, a division of Facit, Inc. (235 Main Dunstable Road, Nashua, NH 03061), has introduced the 4510 dot-matrix printer.

Standard features of the 4510 include three-way paper handling (fan fold with tractor feed, cut sheets and roll paper with friction feed); multifont capability, each with eight international character sets; a 2K buffer; the flexibility of both parallel and serial interfaces; block and pin addressable graphics; ribbon cartridge and operator-replaceable printhead.

The 4510 prints bidirectionally at 120 cps and offers the choice of ten, 12, 17 pitch or proportional spacing, and elongated or underlined printing modes. It accepts paper with width of four to eight inches. It can produce three copies in addition to the original. The printer is priced at $695. Reader Service number 480.

Jupiter Goes Forth

The Jupiter Ace is a new personal computer that uses the computer language Forth. In addition to Forth, the computer features speed four to ten times faster than its competitors; hi-resolution graphics; a programmable on-board speaker; 3K of on-board memory, upgradable to 19K or 51K; full-size moving keyboard; upper- and lowercase ASCII character display; and "flicker-free" screen display.

The computer costs $150. The computer is marketed by Data-assette, 56 South Third St., Oxford, PA 19363. Reader Service number 494.

Apple Speaks

Multitech Electronics, Inc. (195 W. El Camino Real, Sunnyvale, CA 94086) has introduced the Apple Speech Synthesis Board. The board provides Apple users with an easy and economical way to add speech capability to their systems.

The board, which features a 1200-word vocabulary, can be used for language instruction, speech therapy, video games, experiments in speech synthesis and many other applications.

The board is 2¾ × six inches and is based on Texas Instruments' TMS5220 speech synthesis device. The board plugs directly into any spare slot on the Apple II.

Included with SSB-Apple board are a 5¼-inch floppy disk containing the 1200-word dictionary (in digitized form), an instruction manual and a stand-alone high-quality speaker. The board costs $149.95. Reader Service number 493.

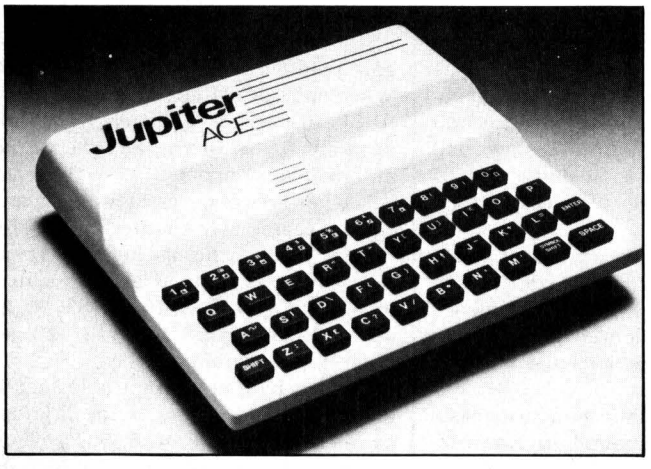
Cassette to TS Interface

The Winky Board II interfaces a cassette machine to a Timex-Sinclair 1000 or ZX-80/81 computer. It is designed to solve most save-and-load problems and includes a program-duplicating system.

The save mode filters 16K RAM Pac electrical interference to yield clean and easy-loading tapes. The load mode helps you load cassette programs with earphone eavesdropping, LED volume level indicators and an electrical interference filter. The duplicate mode permits direct copying of any TS/ZX cassette program, even unsavable, unlistable cassettes. It also saves a program on two cassettes simultaneously using two tape recorders.

The Winky Board II is one by 1½ inches in size and requires no power or hardware modifications. Since it uses the computer and tape-machine jacks, it does not block the RAM Pac connector. It is packaged in a protective plastic box with instructions.

The Winky Board II costs $24 assembled and tested. In kit version, it sells for $18. The earphone is $1. G. Russell—Electronics, RD 1 Box 539, Centre Hall, PA 16828. Reader Service number 485.



The Jupiter Ace features the Forth computer language.

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REVIEWS

(From p. 146)

going through it once or twice you'll see why VisiCalc sells Apples! *(Cdex Corporation, 5050 El Camino Real, Los Altos, CA 94022. $59.95)*

David Goodfellow
Seattle, WA

BADLIM

Weed out those Bad disk sectors With this CP/M program

Have you suffered the excruciating BDOS Error blues? You pound out a long report with your CP/M-based word processing program. The report is due tomorrow and you give a sigh of relief as you finish the summary and enter the command to save the file to disk. BDOS ERR ON A:BAD SECTOR mocks the CRT and your beautiful report is in computer limbo!

If you're lucky, perhaps the portion of the file up to the BDOS ERR can be saved. You'll probably need to reformat the disk to use it again. If you do reformat, there is always the chance that the error will reoccur if it is a "hard" error rather a "soft" error (possibly caused by a stray bit of dust or by static).

BADLIM will help you avoid this experience by eliminating bad disk sectors from use. The software delivers exactly what the documentation promises. You prevent problems by checking CP/M disks for bad sectors on a regular basis.

BADLIM works with both floppies and hard disks. It can be used with single-density CP/M 1.4 or any density CP/M 2.0, but not with MP/M. If you have any problems with a hard disk, perhaps after a power failure, BADLIM may seem like a lifesaver by isolating bad sectors before entering substantial amounts of data.

If BADLIM finds a bad sector, it prints the block in which the bad sector is located and locks out that block from future use by putting it into a special file. This file does not show on the directory listing, but the file length is removed from available free space. Any of your files which include bad sectors are listed as damaged files so you know that corrective action must be taken.

After running BADLIM, if you find damaged data files and have backups, you should do a warm boot on the bad disk. This reorganizes the disk maps with the bad sectors. Then use PIP to copy a complete replacement file from the backup disk. If, after running BADLIM, you are in doubt about the integrity of the disk with the bad sectors, use PIP to copy all of the blocks which do not have bad sectors onto another disk.

To be sure that an error causing a bad sector is not just a one-time transient effect, have BADLIM check the sector from one to nine times before locking it out. If you have already run BADLIM and checked the disk again, sectors previously marked bad will be noted with the message "FROM PRIOR CHECK BAD SECTOR IN BLOCK: xxxx", and the program skips this block.

The distribution disk contains two files not mentioned in the written documentation: FORGET.COM and LATENEW.DOC. LATENEW is additional documentation which tells you that the Forget file will unlock blocks previoulsy marked as bad should you wish to try to use those blocks or check them with BADLIM again.

To process a full double-density disk with repetitive error checks may take several minutes. The author recommends leaving the computer and doing some other project while a full hard disk drive is being checked.

Every CP/M user should have this type of program in his library. Running BADLIM every day on disks you believe are marginal will save you hours of headaches, prevent lost data and permit continued use of the balance of a disk which only contains a few bad sectors. *(BLAT R & D CORP., 8016 188th St. SW, Edmonds, WA 98020, $73.)*

Charles R. Perelman
Beverly Hills, CA

Diskey

What's wrong with that Disk? This Atari program Will help you find out

Diskey is one of the more interesting and useful utility programs to become available for the Atari 400/800 computers. Diskey—which requires a minimum of 32K of memory, a Basic language cartridge and an Atari 810 disk drive—is a Basic/assembly hybrid that will allow the user to examine and modify any sector on a disk, as well as the disk directory.

Any user of the Atari 810 disk drive has probably, at one time or another, lost a file on a disk either because the disk has "crashed" or because he mistakenly deleted a particular file from the disk and then wished he hadn't. Diskey will enable you to repair some damaged files and recover deleted files that would otherwise be lost.

Along with the Diskey program (available on disk only) comes a comprehensive 61-page user's manual, which I would rate as excellent. The manual is divided into three sections and is aimed at the near beginner.

The first section of the manual consists of background information, such as a detailed explanation of the Atari disk format; it also discusses the design philosophy of the Atari File Management System and outlines some common disk problems. Not only is an understanding of this material essential if you want to make any sense of the concepts presented in other sections of the manual, but—as with any program that can write to disk—a lack of understanding in this material could result in the unknowing destruction of existing files.

In the introduction to the manual it is strongly suggested that the user read the entire manual even before inserting the Diskey disk. I know this goes against human nature, but I agree wholeheartedly! The potential to raise havoc on your disks is just too great of you don't understand just what it is you are doing. If, however, you are the type that just can't resist the urge, at least make sure you have a write-protect tab on your disk.

The second section of the manual covers the two main Diskey displays—Sector Map and Disk Map, explains the various functions that Diskey can perform and provides suggestions on how to apply Diskey to various disk problems. The Sector and Disk Maps are the heart of the program and display what is going on inside the disk that is being scrutinized by Diskey.

> Diskey is an interesting and useful utility program . . . for the Atari 400/800

The Sector Map is a display which is divided vertically into two parts: the hexadecimal display, which is on the left side of the screen, and the ASCII display, which is on the right. The hex portion shows the hex value of each byte in the particular sector of a disk that is being examined; the ASCII portion shows the same bytes, but in ASCII.

Any byte can be changed by moving the modify cursor into either the hex or ASCII portion of the Sector Map display and typing in the new byte information. When one side of the display (such as the ASCII display) is changed, the corresponding bytes in the hex display are automatically updated. The hex and ASCII portions of the display are separated by a coarse byte counter, which runs vertically down the display. The coarse byte counter begins at zero and increments by eights (0, 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96, 104, 112, 120) as it progresses down the display.

A given byte in a sector is located by adding these counters to the fine byte counters (0, 1, 2, 3, 4, 5, 6, 7) located along the bottom of the Sector Map display. One complete sector, or 128 bytes,

can be viewed at a time. At the bottom of the Sector Map, information such as sector number, next sector number, drive number, and file name and number are also displayed and automatically updated.

The Disk Map displays a record of each sector on the disk being examined and is used by all Diskey multiple sector functions.

The display is arranged as a matrix, 36 characters across and 20 characters down, with each character representing one of the 720 sectors available on a disk. As with the Sector Map, the Disk Map also contains coarse and fine sector counters on the left and bottom of the display to enable you to obtain the number (0 to 720) of any given sector in the display.

Once Diskey has completed execution of some of its search or error-recover functions, such as the locate-bad-sectors function or file-trace function, it will display the Disk Map containing the results of its findings. Various characters, each with a different meaning, are used to convey to the user the status of each sector on a disk.

The third section of the manual is the one that you will find yourself referring to frequently. It describes the Diskey keyboard and the keys that must be used to have Diskey perform its various functions. This section is arranged alphabetically by key and provides a description of the Diskey function that corresponds to each keyboard key. Although a detailed explanation of each of the functions is beyond the scope of this review, the 57 functions that Diskey can perform provide the user with the tools necessary to view, analyze and modify disk data in a variety of ways.

Diskey includes other nice features such as decimal-to-hex and hex-to-decimal conversion, as well as an RPM test for checking the speed of your 810 disk drive. If your disk drive is not operating within the recommended 285 to 290 RPM range, the manual provides a procedure for opening up your drive and adjusting it to bring it back into the correct range. I have used this RPM test and procedure to adjust the speed of my disk, and it is easy to do. Naturally, if your disk drive is still under warranty, you should think twice before opening it up, since doing so will void your warranty.

Does Diskey perform as advertised? The answer is a definite yes! I have purposely deleted files and changed (damaged) the linkages between the sectors of a file and have been able to totally restore the files by using Diskey.

As pointed out in the Diskey manual, however, there is no magic wand for fixing disk problems. Although Diskey provides the user with tools (functions) to locate disk problems, it is still up to the user to judge exactly what is wrong and correct it. This is another reason why you should read, as many times as necessary, the background material in the first section of the manual until you fully understand it. I hope this doesn't scare some people away, because it is really not that difficult.

> JRT Pascal . . .
> allows you to run
> programs larger
> than your computer's
> memory capacity

Another aspect of Diskey, which I didn't realize until I sat down to write this review, is the fact that it is educational. If you are the type of person who likes to know the how and why of things and just must get inside of them to see what makes them tick, you'll enjoy poking around in your disks with Diskey.

Up until now I have spoken very highly of Diskey; however, it does have one problem—it's temperamental. Diskey does, on occasion, either lock up the keyboard entirely or crash, presenting you with a Basic error. You are then forced to boot Diskey back into your system. Although I am at a loss to explain exactly why this occurs, I can only conjecture that in doing repetitive data transfers from disk to memory, Diskey "trips over its own feet" occasionally. Although this can be annoying at times, I feel that Diskey's value in fixing disk problems and the opportunity it provides to learn about what goes on inside your disks, would make it a worthwhile addition to your program library. *(Adventure International, Box 3435, Longwood, FL 32750. $49.95)*

Richard J. Maryanski
Eatontown, NJ

JRT Pascal

This Pascal compiler is Useful, if you know how to Write Pascal programs

I have some good news and some bad news. The good news is that JRT Systems Inc. is selling a Pascal compiler and run-time system for $29.95. That is the cheapest price for a computer language since EBasic entered the public domain.

The bad news is if you don't know how to write Pascal programs you won't be able to use it. The manual is a terse reference book, not an instructive tutorial.

JRT Pascal has an unique way of allowing you to run programs larger than your computer's memory capacity. Pascal programs can be compiled in sections and each section can be stored on any disk in your system.

You then write a main program that refers to each one of these sections as "external procedures." When the main program is executed, each external module is read into memory as it is first referenced.

If the memory manager can't find the module on one disk, it will search another. If the external module is already in memory, JRT Pascal doesn't waste time reading it off the disk again. When the memory manager runs out of space and has to read in another external module, it will look for a old module that hasn't been used for awhile. The old one

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is deleted and the new one is read in.

The external module doesn't have to be a Pascal program. It could be an assembler program. JRT includes a relocating assembler, so you don't have to worry about assigning absolute addresses. The memory manager can read the assembly module anywhere into memory and it will still execute correctly.

The JRT advertising brochure lists the usual number of arithmetic and trigonometric functions, but doesn't mention that some of them are not part of the Pascal compiler. They are included on the disk as external functions. The following functions are external; ARCTAN, COS, EXP, LN, SIN and SQRT. The advantage of doing this is if you don't need them they don't occupy any memory. The disadvantage is programs that use these functions will run slower—not just a little bit slower, a lot slower. The first program I wrote was a translation from a Basic program to solve a system of two first-order differential equations. The Basic program can be found in *Computer Applications for Calculus* by Dorn, Bitter and Hector; Prindle, Weber & Schmidt, Inc., 1972, p. 138.

The DIFYQ program took one minute and seven seconds to compile. That's not terrible, but it still seems a bit much. The surprise came when I tried to execute the compiled program. It took four minutes and 55 seconds to complete on a 4 Mhz Z80 computer! That is terrible.

Just for laughs I tried the same program on a 2 Mhz vintage 1975 IMSAI computer. As expected, it took about twice as long.

I really didn't think I was taxing the system with this program, so I edited the program by adding two characters that turned the function declaration statements into remarks. I then compiled the program using Sorcim Pascal/M version 3.2. DIFYQ took 35 seconds to compile and only 12 seconds to execute! Since Pascal has no real advantage over Basic when the programs are short, I tried running the DIFYQ program in Microsoft Basic Version 4.51. The execution time was also 12 seconds. Evidently, the run time for this program was increased almost 25 times by using external functions for sine, cosine and exponentiation.

Any program that I executed that did not have external functions in it was able to execute in a time that was either unmeasurably or insignificantly different from other microcomputer Pascal systems.

Another advertised feature of JRT Pascal is its ability to handle numbers ranging from 10^{-64} to 10^{+63}. That is an impressive extension in floating-point range over other Pascals. I decided to test it. If the SIN function correctly handles small numbers it should return the argument all the way down to the lower limit of the floating-point range. It doesn't. Since the source code for the external function is included with the disk, I was able to see the problem. The argument of the sine function is squared before a range check is performed. The natural log function has a similar difficulty. It cannot accept an argument below 10^{-20}.

> I do want to see Pascal more popular. Lowering the price to $29.95 should do that.

The inability of the LN function to handle small numbers prevented a program to test a random number generator from executing. By changing the external function statements to remarks, I was able to execute this program correctly using Pascal/M even though its floating-point range is only 10^{-38} to 10^{+38}.

There are some nice extra application features that are not normally included with language packages. One is an external procedure that computes arithmetic mean, standard deviation, variance, skewness, kurtosis (this gives you information about the distribution curve near the mean) and the first four moments about the mean.

Another procedure formats x-y graphs and scattergrams. There is even a procedure that can tell you where your program spends most of its time. This could be useful in optimizing your program for execution speed.

If you make a mistake in your source program, the compiler prints out a message, not an error-code number. Your program can turn a trace procedure on and off to help in finding logic errors; that's good.

I tried to push the compiler to its limits by purposely making mistakes. Unfortunately, the compiler is not very robust. I was able to cause a run-time error in the compiler itself by leaving out a colon. I also found an error that put the compiler into a infinite loop and another time caused it to stop; that's bad. All of these errors have been reported to the company and will probably be corrected in a later release.

I've probably spent too much time on negative things in this review. My complaints mainly concern the "fit and finish" of the system. I do want to see Pascal more popular. Lowering the price to $29.95 should do that.

JRT Pascal has all the standard features of the language (except for Get and Put) and no limits on the size of procedures, nesting levels and recursion. They have added a String type that can hold up to 64K characters. They have included built-in functions to find absolute addresses of variables, communicate with peripherals without passing through CP/M and several functions that operate on strings.

If your applications are in business or word processing, JRT Pascal will be more than adequate. If, however, your applications are in computer graphics or scientific programming you will be disappointed. *(JRT Systems, Inc., PO Box 22365, San Francisco, CA 94122. $29.95.)*

Mike Aronson
Oregon City, OR

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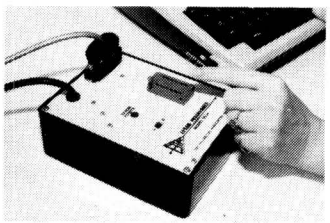

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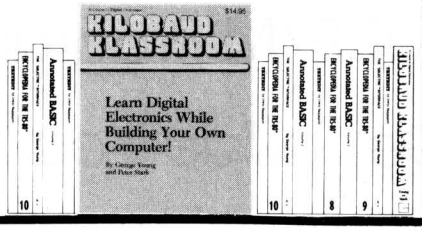
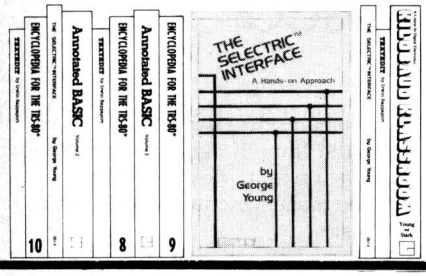


THE SELECTRIC INTERFACE by George Young



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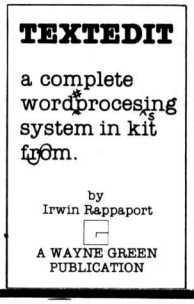

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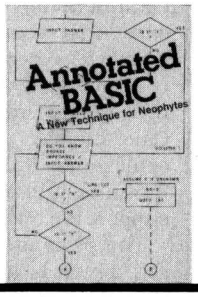

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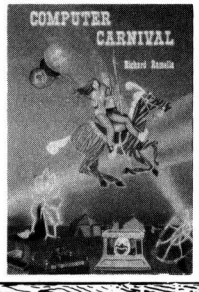

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Can Learning VisiCalc Be Fun?

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The Good and the Bad of JRT Pascal

Cdex Training for VisiCalc

This program makes Learning VisiCalc Almost enjoyable

It's been said that VisiCalc has sold more Apples than has any other product —software or hardware. This may be true, because the program certainly turns the Apple into a powerful business tool. The program has kept a number of writers in business producing books that suggest VisiCalc applications.

However, VisiCalc has one problem that puts a damper on its use—its complexity. The program's power makes it difficult to master.

Enter Cdex Training for VisiCalc.

Cdex Training for VisiCalc is a high-quality tutorial using the concepts of programmed learning to present all the capabilities of VisiCalc in a manner that allows the user to become a VisiCalc expert almost in spite of himself.

I've had VisiCalc for about two years and use it for some pretty simple applications. I haven't used the full power of VisiCalc because its difficulty has been greater than my need—not anymore.

Cdex Training for VisiCalc has unlocked VisiCalc for me by reminding me what the program can do and, more importantly, by showing me how easy it is to use.

Teaching Approach

The teaching approach used by the program seems almost childish at first, asking for your name and then using it to personalize instruction. It uses happy music and lavish praise for correct answers to review questions, and gentle criticism with appropriate tones in response to wrong answers. This approach grows on you. Before you're halfway through the first disk, you have entered a conspiracy with Cdex; together you will unlock the secrets of VisiCalc. You will become a VisiCalc expert and your teacher (Apple/Cdex) will be proud of you. The program doesn't say this, of course, but that's the effect it had on me. It's very effective and a fun way to learn.

The manual has an introduction and three sections—Command References, Examples and Exercises. The first two sections present stand-alone information. The Exercises section is tied to the tutorial disks.

The introduction is basically a description of the package and information for the new computer user—how to handle the disks, etc. There's no real meat there in terms of VisiCalc.

Section 1, Command References, is an excellent index to VisiCalc commands. Its 22 pages are nearly twice the space required for this information, because each referenced command has a page to itself. This makes it much easier to use than it would have been had Cdex elected to save paper.

Section 2, Examples, is valuable for its applications information. It includes—

- Sales Report
- Student Performance Record
- Stock Portfolio Analysis
- Personal Net Worth Statement
- Profit and Loss Statement
- Cash Flow Forecast
- Pricing Model

Each has a sample printout and a listing of the keystrokes required to build it.

Section 3, Exercises, contains eight exercises which support the lessons on the disks. These exercises reinforce the material in the lessons and are effective tools.

Tutorial Disks

The master menu on Disk #1 has six items:

A. How to Use this Program
B. Key Terms You Need to Know
C. Moving the Cursor on the Worksheet
D. Labeling Columns and Rows
E. Entering Values and Formulas
F. Working with Functions

You can select these in any order, but the first time through it's probably best to take them in the order shown.

The master menu on Disk #2 has five items:

A. Using Commands
B. Saving and Retrieving Your Work
C. Printing Your Work
D. Replicating: The Concept
E. Replicating: The Process

Whichever disk you use, and whichever menu selection made (except "A" on Disk #1), the lesson begins with basic instructions on the subject at hand, followed by review questions.

A correct answer is greeted with appreciative sounds from your Apple and words of praise on the screen; an incorrect answer is met with sounds of disappointment and tactful statements to the effect that your answer was not quite what was expected.

The basic instruction is accompanied by a graphic representation of the VisiCalc display. Animation of sorts is achieved by dropping labels, values and formulas into the display as needed to support the text.

The program uses its own character set, which is larger and easier to read than the normal Apple character set.

The reference disk is a compacted tutorial covering VisiCalc's total command set in six sections, which are accessible from the master menu:

A. Using Commands
B. Using Built-In Functions
C. Key Worksheet Terms
D. Entering Lables
E. Entering Values
F. Entering Formulas

Conclusion

If you're having difficulty with VisiCalc, or suspect you have applications for it that you don't know how to implement, Cdex Training for VisiCalc will help. You'll find it easy (even fun) to use. After

(Continued on p. 142)

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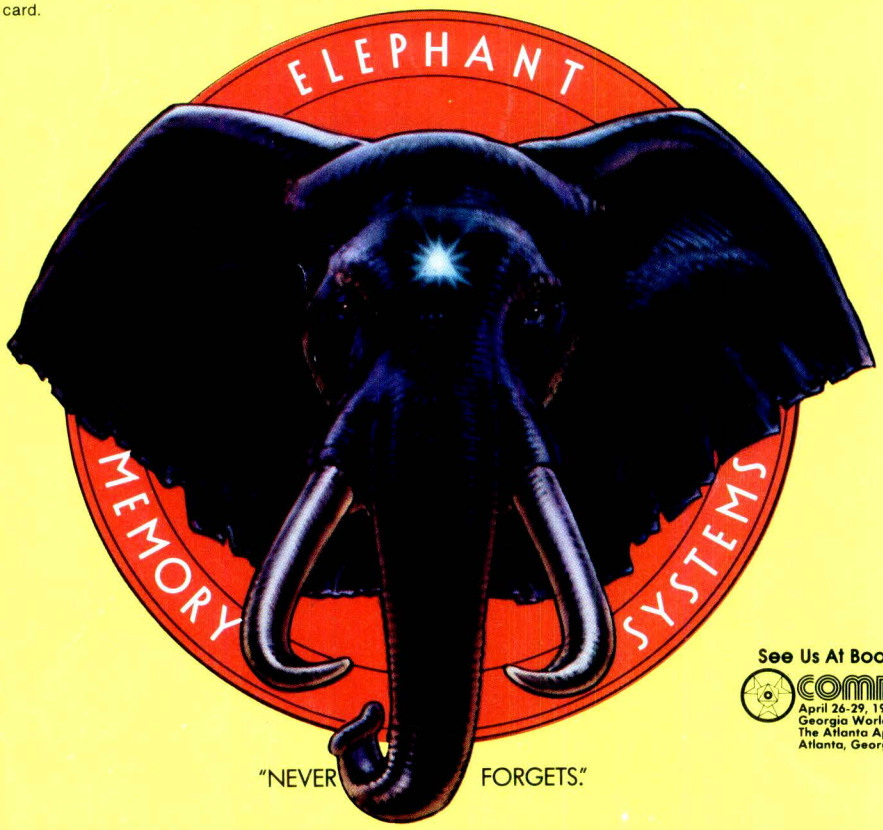

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